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Machinery for Charging and Drawing Retorts.

As preliminary to some notices of American machinery for charging and drawing gas retorts, which we contemplate making in the present volume, we give, herewith, number of diagrams illustrating apparatus which have been proposed, and some of which have been put in use abroad, for this purpose. We very conveniently find to hand, information concerning these inventions, in the columns of our London contemporary, *The Engineer*.

On the 5th of May, of the present year, Mr. John Somerville, of Dublin, read a paper before the Society of Engineers, London, on the charging and drawing of gas retorts by machinery. The diagrams, which we republish, form a part of this essay, which is printed at length in the journal above alluded to. After a somewhat lengthy introduction, devoted to the importance of machinery of this class, and the great advantages secured by its introduction and use, not only to the companies manufacturing gas, but to the public, the author proceeded to say that machinery for emptying coke ovens, has, for years, been in use on the continent, but the earliest form applied to the process of gas production was Clegg's Revolving Web Retort, Fig. 1.

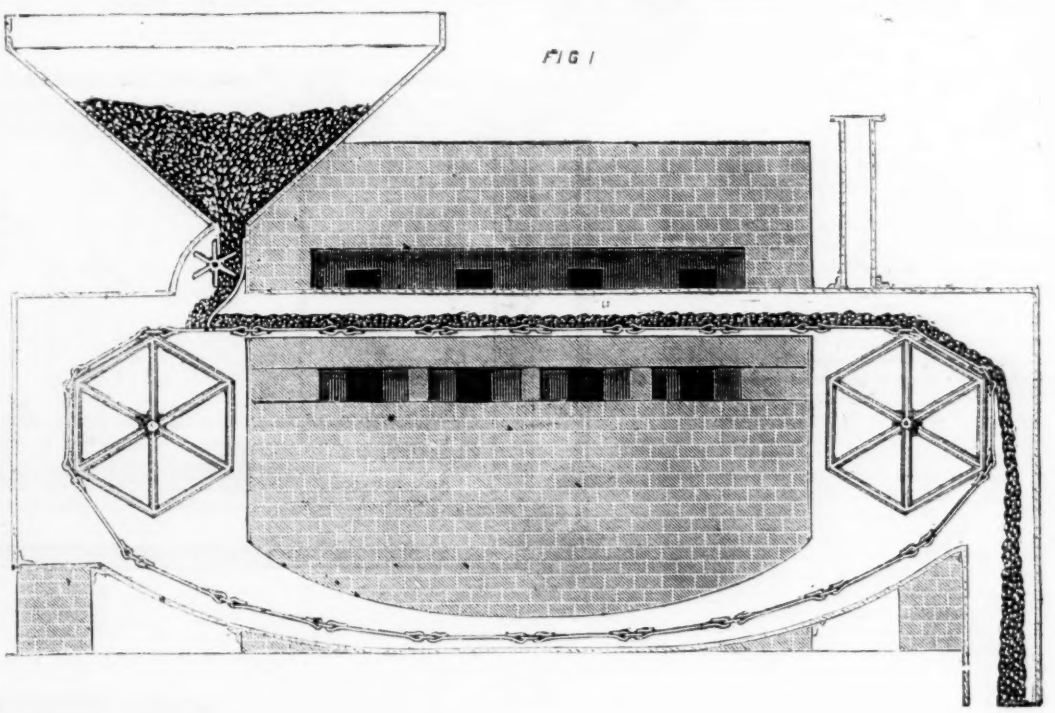


FIG 1

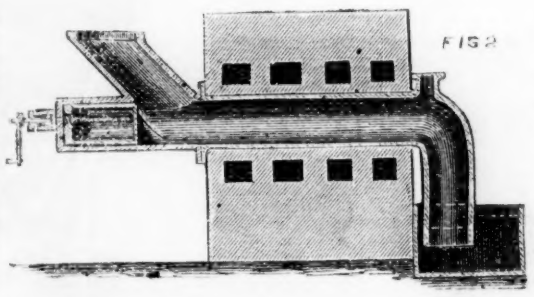


FIG 2

This was an arrangement by which fine coal was mechanically fed through a hopper on to a web formed of wrought-iron boiler plates, and made to travel continuously over revolving drums, the whole being enclosed in a retort and chamber made of wrought-iron, and heated by a furnace underneath. The coal was charged on to the web, and the coke, after the liberation of the gas by traveling through the retort, fell into a cooling chamber. This arrangement was the earliest form of charging and discharging by machinery, but it did not answer.

The next attempt was in 1840, by Mr. Brunton, with his discharging retort, Fig. 2, but which met with no better success than Clegg's, the same defective principle being apparent in each. The coal was discharged through a hopper, and the successive charges were propelled along the retort by the action of a piston working through a stuffing-box in the retort-lid. The coke was discharged into a box containing water, into which the end of the retort dipped. It is not very difficult to imagine the condition of the coke when taken out of its water bath.

The next contrivance, Fig. 3, was the first attempt at a "steam stoker." Mr. George Michael took out a patent for the improvements in the manufacture of gas, and remarks in his specification that with the present state of progress in the different arts which co-operate in the construction of gas works, the power of the manufacturer may be increased, and the gas produced more economically than by the present mode, without employing large numbers of fine strong men, to destroy their health, by charging red-hot retorts through very narrow apertures with small quantities of coal, and to perspire for twelve hours in front of an intolerably hot radiating surface.

He proposes to substitute for the sinews of these men the action of steam power. and with this intention he considerably amplifies the usual dimensions of a retort in order to obtain in one distilling apparatus as much, if not more, heating surface than is now found in a whole bed of sixteen retorts 20 feet long. This he does for the purpose of having the floor of retorts all on the same level, in order that the steam apparatus used for charging and drawing one of them may be adapted to the others by only moving such apparatus upon rails in front of the retorts. Then he described a huge retort 39 feet long, two feet high and nine feet wide, built of bricks, and having, at each end, a cast-iron mouth-piece plate, contrived for receiving a luted lid, which is firmly secured by screws and cotters. This retort is provided with two or more orifices at the top, by which the charge of coals is introduced by tilting wagons running on railways. The coals so introduced into the retort are then spread equally over the bottom by the aid of a rake, which forms the head of a rack, worked by a steam engine. The charge of coal is six tons, forming a layer of ten inches deep. When the charge is worked off, the coke is pushed out in one cake by the assistance of the steam rack, the head or rake of which is, for this purpose, inverted, so as to act with its head instead of its teeth.

The rack, with the rake at the end of it, is of cast-iron, and slides in a cast-iron frame, and receives its

motion from a steam engine fitted to the frame, motion being transmitted by the ordinary mechanical contrivances. In order that the same steam apparatus may be rendered serviceable for working 24 retorts or more, the frame rests on a system of wheels running upon rails parallel to the front of the retorts. The steam is conveyed by means of a pipe placed in a casing, and surrounded by sand or other non-conducter, and running the whole length of the beds of retorts. The pipe is provided with outlet branches and cocks between each two retorts, for the purpose of delivering the steam to the engine through a movable conducting pipe. This arrangement was a cumbrous one, and never came into use.

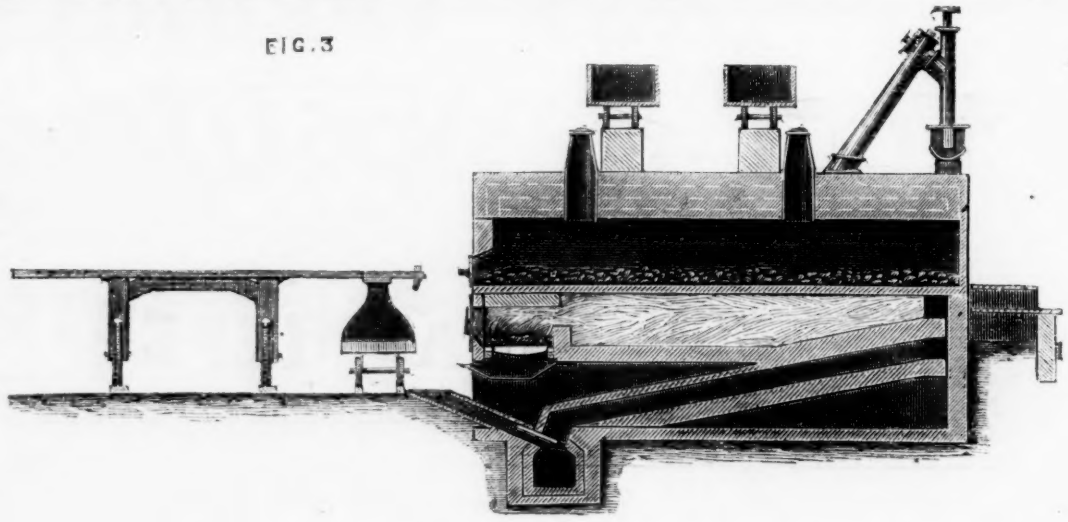
In describing the next step towards the production of a steam stoker, we may pass by those arrangements for which a number of patents have been granted from time to time, in which the mechanical feeding of coal by an archimedian screw, through a retort, and the delivering of coke or breeze (for coke it cannot be) at the other end, are the chief features. However desirable the working of retorts by this description of machinery may be, there is the great drawback of bad coke, or none at all, being produced, which every gas manufacturer knows to be a serious disadvantage.

The next arrangement of a steam stoker was that of Mr. Green, of the Preston Gas-works, in 1860 (see Fig. 4), which is the first that professes to draw and discharge ordinary retorts. Great credit is due to Mr. Green as having been the pioneer of drawing and charging machinery in retort-houses, his first attempt being the basis upon which succeeding machines have been constructed. It consisted of a frame-work mounted upon four wheels, running upon rails laid parallel to the front of the benches of retorts, and was worked by a continuous shaft which was carried the full length of the retort-house, and communicated motion to the machinery. The rake and scoop were mounted upon a table or platform capable of being raised or lowered to the varying heights of the retorts. A long screw, driven at a rapid rate, propelled the rake and screw into the retort, and a reverse action withdrew them, while the rake-head, as well as the scoop was also filled by hand from the retort-house floor. It was found, however, that this arrangement would not answer, and it never got beyond the provisional specification, and, like the previous invention, was abandoned.

Next comes the Best and Holden machine (already illustrated in the *Engineer*). It was first erected and tried experimentally at the Horseferry Works of the Chartered Gas Company. The Alliance Gas Company, of Dublin, having occasion, in 1867, to erect a new retort house, made arrangements for the introduction of this machine there, as they had been annoyed by strikes among the stokers. The retort-house was accordingly built to receive four of these machines. Thirty benches of nine retorts each were constructed to suit this new system of drawing and charging. The nine retorts were set in a bench, at equal distances from each other, in three rows of three retorts each, one above the other, this arrangement being necessary, as the machine draws or charges three retorts at a time. Each vertical file of three retorts opened into a common chamber, which was closed with one door after the retorts were charged—one ascension pipe from the chamber conveyed the gas to the hydraulic main.

The door was planed for three inches on its face, to come in contact with a corresponding planed surface on the chamber or mouth-piece, so as to make a gas-tight joint when tightened up by three cross-bars driven into wedge-shaped lugs. After some time, these doors, which were seven feet long, and two feet wide, were found to fail, the great heat causing them to expand unequally, and the heavy blows on the cross-bars, necessary to bring the plane

FIG. 3



GREEN'S PATENT
SIDE ELEVATION

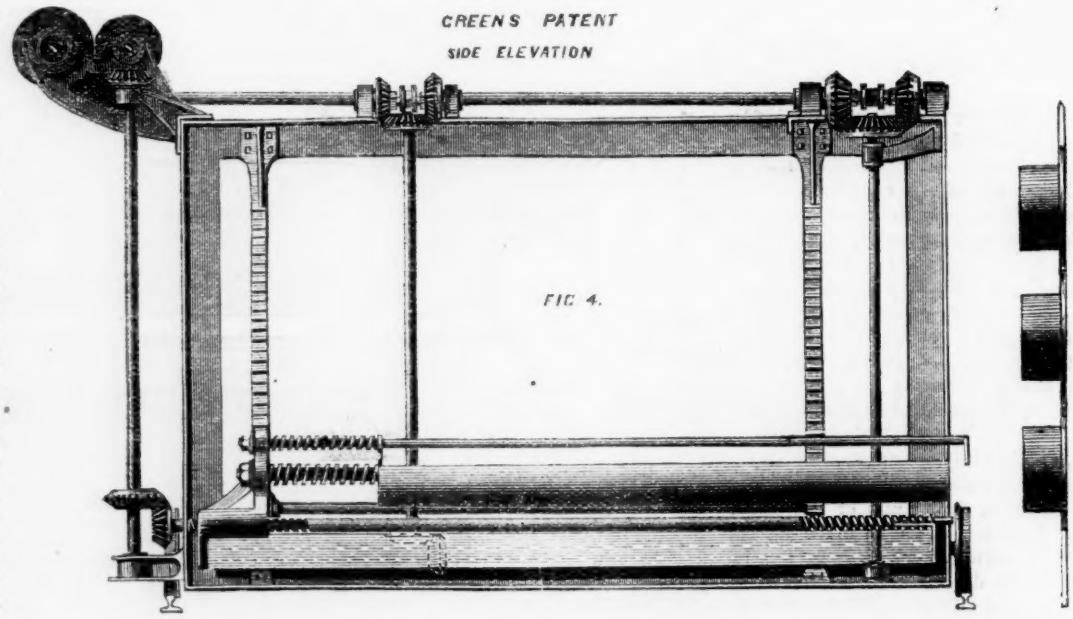
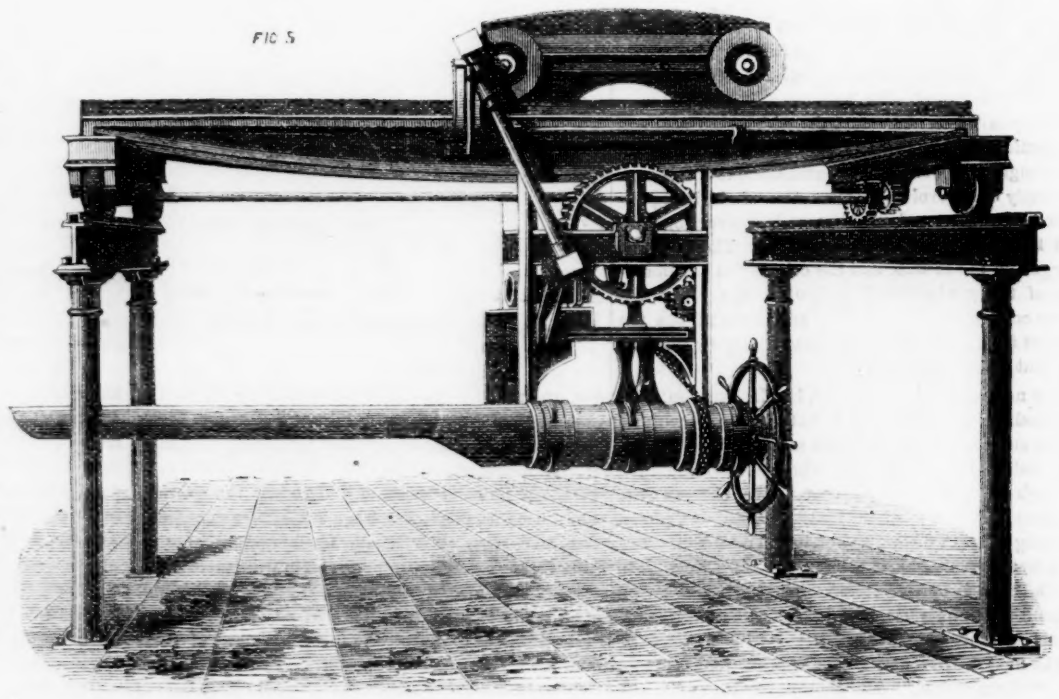


FIG. 4.

FIG. 5



surfaces together, making them warp and twist. These doors have been superseded by luted lids.

The machine consists of a strong combined frame-work of wrought and cast-iron, moving on flanged wheels upon rails as in the previous machines. The benches are elevated, and the machines run on a stage nearly level with the bottom retorts—the stage is supported by a double row of columns placed under the rails. A platform on the frame work of the machine

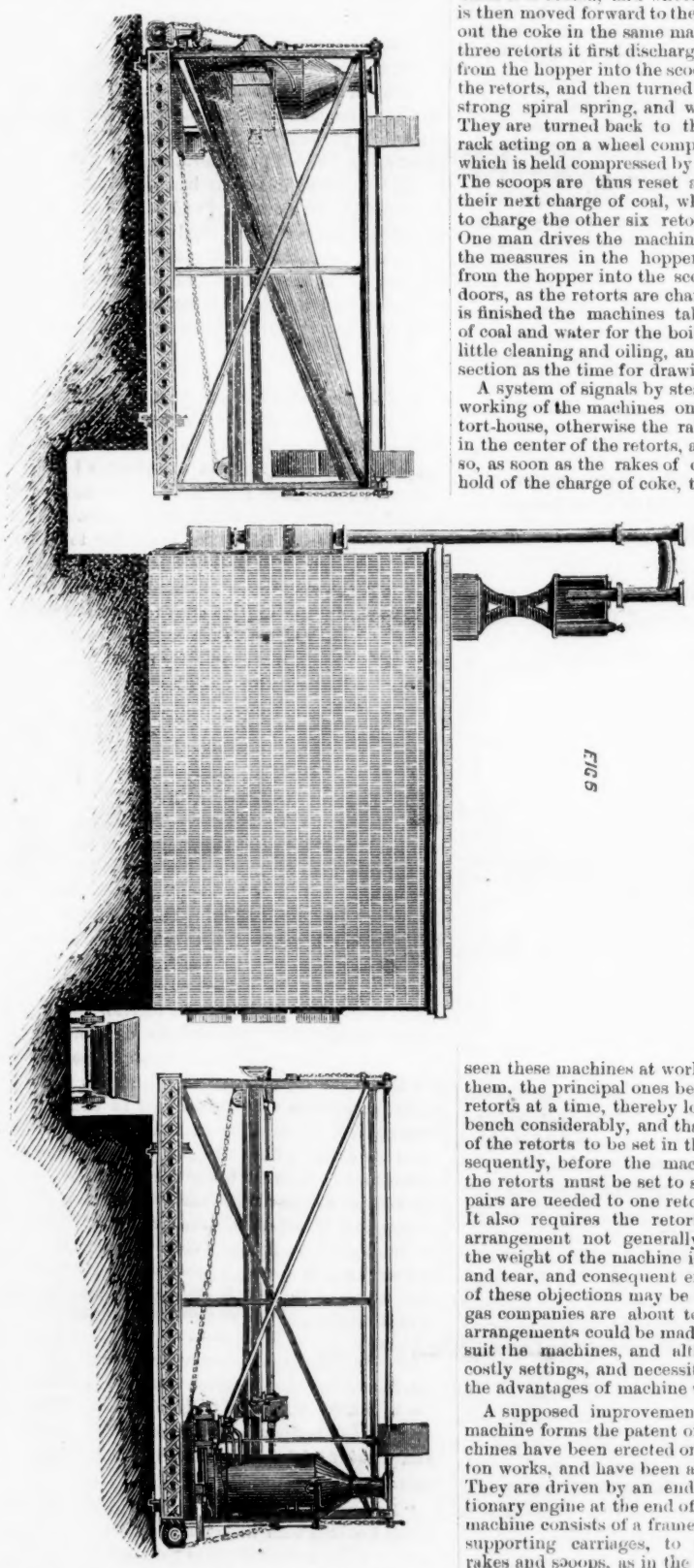


FIG 5

carries an upright boiler with a double cylinder engine attached. The engine, which is fitted with common link-reversing gear, drives a shaft upon which are geared two pitch chains attached to two carriages, having four small wheels running upon the inside flanges of two girders, and carrying respectively the three rakes and the three scoops.

Above the carriage is a hopper, supported by columns from the bottom framing, for containing the coals for a charge. The machines, on either side of a range of benches, take in their supply of coal and water, and a section, of nine retorts, having been opened, they advanced along the rails till they are opposite the first three. The rakesman throws up the head of the rakes, and they are sent forward into the retorts. When in the center of the retort, he lowers the rake heads, and they are drawn out, and the heads being at right angles to the retort bring out the coke before them, which falls into a wagon under the stage, when it is cooled, and wheeled away. The machine is then moved forward to the other open retorts, draws out the coke in the same manner, and returns to the three retorts it first discharged; coal is then let down from the hopper into the scoops, and they are sent into the retorts, and then turned over by the release of a strong spiral spring, and withdrawn thus inverted. They are turned back to their proper position by a rack acting on a wheel compressing the spiral spring, which is held compressed by a catch till again released. The scoops are thus reset and held in position for their next charge of coal, when the machine proceeds to charge the other six retorts in the same manner. One man drives the machine, two trim the coal into the measures in the hopper, and one guides the coal from the hopper into the scoops, and also closes the doors, as the retorts are charged. When the section is finished the machines take in a fresh complement of coal and water for the boiler and rakes; they get a little cleaning and oiling, and are ready for the next section as the time for drawing again arrives.

A system of signals by steam whistles, regulates the working of the machines on opposite sides of the retort-house, otherwise the rakes or scoops would meet in the center of the retorts, and probably get damaged, so, as soon as the rakes of one machine have taken hold of the charge of coke, the engine-driver signals to the other machine to enter, which then takes hold of its charge. The same is done when the scoops are sent in, the driver signals when his scoops are reversed and the opposite driver sends in his. By these means a collision is avoided, and yet it leads to no delay, No. 2 machine keeping a few seconds behind No. 1. When in full work the retorts are drawn and charged at the rate of sixty per hour, to three times as quickly as by hand. The quantity of coals put into each retort is twenty hundred weight per twenty-four hours, the retort being 18 inches diameter and 20 feet long; this quantity varies at times, according to whether coal or cannel is being used. Engineers who have seen these machines at work have made objections to them, the principal ones being that they charge three retorts at a time, thereby lowering the heats of the bench considerably, and that they require the whole of the retorts to be set in the same positions. Consequently, before the machines can be adopted, all the retorts must be set to suit them, and if any repairs are needed to one retort two others must be idle. It also requires the retorts to be set on a stage, an arrangement not generally approved of; others say the weight of the machine is too great, and the wear and tear, and consequent expense, excessive. Some of these objections may be met by saying that where gas companies are about to build new retort-houses, arrangements could be made for setting the retorts to suit the machines, and although they may be more costly settings, and necessitate the use of a stage, yet the advantages of machine work would be gained.

A supposed improvement on the Best and Holden machine forms the patent of Mr. Holden, and two machines have been erected on this principle at the Beckton works, and have been at work there some time. They are driven by an endless wire rope from a stationary engine at the end of the retort-house, and each machine consists of a frame-work mounted on wheels supporting carriages, to which are attached three rakes and scoops, as in the Best and Holden machine. The rakes and scoops, however, are capable of being swung out at right angles to the retorts, so that only one or two may be charged or drawn at pleasure, thus, any one of the three may be left off for "scurfing" or repair, while the other two, in the same file, may be at work. This machine does not carry its own coal, but the scoops have to be filled by hand. In the course of time, arrangements are to be made for filling them from a shoot at the back of the stage, the scoops swinging round to receive their charge of coal, and back again to deposit it in the retort; the mouthpieces are closed singly, and have one ascension-pipe to each.

Some four years ago, Messrs. Dunbar and Nicholson patented a single scoop machine (see Fig. 5), which was tried at one of the London works, but its working presented no advantages; and it has not been adopted—the complicated action of the machine, and expensive character of the arrangements for adopting it in a retort-house, being against its use. The machine was suspended from traveling girders overhead, which moved up and down the retort-house like a traveling-crane, one rail being attached to the wall of the house, the other being supported upon columns in front of the benches. It received its steam through a pipe running along the retort-house wall from a stationary boiler, and the whole of the machinery moved backwards and forward, in going in and out of the retort. The scoop was filled by hand from the floor of the house, and turned by hand in the retort. The rakes were a series of blades fitted into the scoops, which were put into the retort inverted; and then, by the action of a hand-wheel and gearing, the rakes were turned round and cut-off, the coke in sections to be drawn out. The whole machinery was capable of being raised and lowered, so as to enable it to command any one retort in the setting.

The next system is that introduced by the author, and which is known as the Somerville and Robinson's machine (see Fig. 6). This arrangement embodies improvements suggested by several years' experience with the Best and Holden machine at Dublin.

Having, from time to time, made improvements upon the Best and Holden machine, so that they worked more satisfactorily each succeeding year, and realizing the advantages of machine work, and the desirability of adapting machinery to the charging and drawing of retorts, as at present set in the other retort-houses of the Dublin works, that is, in benches of sevens, these machines were designed, built, and set to work some twelve months ago, and are now working, and giving every satisfaction.

In this arrangement there is one machine for charging, and another separate machine for drawing; each machine carries a small boiler and engine of about two horse-power, with the necessary gearing, and runs upon an inverted bridge rail sunk level with the retort-house floor, so that there may be no obstruction to wheel-barrows, or to the ordinary work of a retort-house.

The machines are each composed of three lattice-girders connected together, and supporting the boiler and engine, and carrying a frame work of wrought T iron. Within this frame-work is a platform carrying the rake or scoop, and capable of being raised and lowered at pleasure, to suit any height of retort. Thus, with the horizontal motion of the machine upon the rails, and the vertical motion of the platform, the rake or scoop commands any retort, whatever may be the position of the bench.

The rake and the scoop each have motion given to them by means of a chain passing over suitable pulleys, driven by the engine. The scoop receives its coal as it enters the retort from a shoot, it having been raised by an archimedian screw from the hopper at the opposite end of the machine. The hopper is supplied by a man from the floor of the house, in the absence of any overhead arrangement.

The method of working this machine is as follows: One man takes off the lids of the retorts of one row, the drawing machine moves opposite to one retort, sends in the rakes, and, at one draw, brings out the coke, and then moves on to the next retort, and the charging machine comes up to the discharged retort, and puts in the charge of coals. The scoop is made double, and forms two small scoops hinged together, and discharging in opposite directions, so that, in turning, the coals are spread well over the surface of the retort, thus utilizing the greatest amount of heating surface in the retort. As the retorts are charged, the man who preceded the drawing-machine, and took off the lids, now follows the charging-machine, closing the retorts. Two boys drive the machines, one man fills the coal into the hopper, and another attends to the taking off and putting on of the lids or doors. The platforms of the machines are now altered to the level of the row of retorts to be drawn and charged next, and those operations proceed as before. By these arrangements the retorts are exposed to the action of the atmosphere a much shorter time than in the case of hand labor, as the stokers generally "slack out" ten or a dozen doors at once, and draw them all before charging any, thus leaving the first drawn retort a long time to the cooling atmosphere, whereas with the machine, the retort is charged directly it is emptied, an advantage that must be appreciated by all gas engineers. The machines are in constant action from six A. M. to six A. M., with the exception of the breakfast and dinner hour for each "shift." The retorts are timed so as not to fall due at those hours. The work of drawing and charging is done with a regularity that cannot be attained by manual labor; the retorts are supplied with the maximum quantity of coal they

will take, and the quantity does not depend upon the caprice of a scoop driver. The coke must be raked out clean, and a quantity cannot be left in, as is often the case with manual labor when the eye of the foreman is not on the men. The same quantity of gas is made on Saturday nights and Sundays as on any other day of the week, a result not often obtained with hand labor.

The author then devoted considerable space to estimates of economy by the use of this machinery, the results of which is, that he claims a saving of 8d. per ton on the labor of stoking alone. He then briefly alludes to four applications for patents, made since the commencement of the present yerr, an apparatus of this kind, as an evidence that the subject is now claiming the increased attention of engineers. He also briefly alludes to a patent obtained by Mr. T. F. Rowland, of Greenpoint, New York, for drawing and charging gas retorts. In conclusion, he predicts that these machines will surely, though, perhaps slowly, supersede hand labor, and that whatever system may ultimately be generally adopted, it matters not, so long as the advantages of machine stoking are secured.—*American Artisan.*

Coal in Turkey.

J. Lewis Farley, in "*Iron*," gives us the following important information:

Coal is found in the mountain ranges of Roumelia, as well as in the districts of Asia Minor forming the measures in Asia Minor. The only coal-field of which we have any definite information is in the neighborhood of Heraclia. In this district the mineral crops out on the surface, and the seams, which vary in thickness from three to eighteen feet, have been inexpensively worked by adits into the side of the mountain; but, through unskilful working, they do not give, either in quantity or quality, a tenth part of what they are capable. The best coal has, hitherto, been procured from the valley of Kosloo, which is in immediate vicinity to the coast, and most eligibly situated for coaling-vessels from shoots without any intermediate boat carriage. The Kosloo could, without any extraordinary effort, yield about 30,000 tons of coal per annum, and of a quality equal to the very best Newcastle, having a loss of only seven per cent. in clinker and ashes.

In the valley of Songoul, which adjoins Kosloo, the coal seams are from nine to twelve feet in thickness, and the coal itself is quite equal in quality to, and much harder than, the Kosloo. In fact, the whole of the Songoul valley contains excellent coal, which might be shipped in the same way as Kosloo, without the necessity of breaking off. This important coal district is situated about 130 miles from the entrance to the Bosphorus, and is in every respect most eligibly placed for water transport. The coal at Kosloo is brought to grass at about six shillings per ton; but, being rather soft in grain, is much deteriorated in quality when it reaches market, owing to the clumsy and unworkmanlike manner in which it is manipulated by the natives, who alone are available for the work.

The relative value of the coal of this district in Asia Minor to Newcastle coal, with which it has been compared, will be apparent from the following statement:

Newcastle.	Spec. Grav.	Coke	Clinker Ash.
Haswell Wallsend	1·28	62·70	——
Hedley's Hartley	1·31	72·31	4·2
Carr's	1·25	60·63	5·14
North Percy	1·25	57·81	——
Broomhill	1·25	59·20	——
Heraclia			
Average of Two Samples	1·32	72·5	7·0

In forming an opinion, however, as to value of Heraclia coal, it is necessary to remember the surface character of the mineral, and the mixture of inferior with superior sorts, inseparable from an extensive employment of unskilled labor. The coal is easy to win, and is turned out large and merchantable. In depth, the quality would, without doubt, improve; while, if steam colliers were employed in its transport, instead of the small sailing craft now in use, a marked difference would soon be observable in the size and general and general appearance of the coal when delivered for consumption. This splendid property, however, will probably remain unproductive to the Imperial Government, until foreign enterprise is invited to do that, for the accomplishment of which the capital and industry of the country is inadequate."

Chemical Repertory.

No. 96.—July 16, 1873.

EDITOR—HENRY WURTZ.

CHEMICAL EXCERPTS.

791. Combustion of the Diamond.—An experiment lately made by Mr. Spence, of Manchester, seems to prove that under certain conditions the diamond is combustible at a much lower temperature than has been hitherto supposed. A South African diamond of the size of a small pea, coated with refractory clay, was placed in a crucible with a mixture of soda and hydrate of lime, and then heated in a muffle for three days and three nights. On opening the mass, it was found that the diamond had entirely disappear, although the heat had never exceeded a cherry-red.—*Les Mondes.*

792. A New Experiment.—Mr. Elihu Thompson has made the observation that tinfoil, if wrapped about a few crystals of chlorate of potassa, can be made to detonate loudly upon being struck smartly with a hammer upon an anvil, or in a mortar. The phenomenon being precisely analogous to the well-known experiment of triturating sulphur and the chlorate. To the best of our knowledge the observation that such metals as tin can be oxidised in this way is a new one and worthy of notice.—*Journal of the Franklin Institute.*

793.—Expansion and Compressibility of Gases.—Amagat.—The main results of the exhaustive researches here described are:

1. Unless gases are well dried, their expansion is (the vessels in which the operations take place being quite dry) not so great as has hitherto been assumed.

2. The differences of the coefficients of the expansion of gases is not, as has been sometimes stated, due simply to moisture.

3. It is impossible to base a hygrometric method on part which the moisture of the air plays in its expansion, because, even when the hygrometric condition of the air differs greatly, the variation of the coefficient is difficultly appreciable.—*An. der Ch. Ph.*

794. A New Fuel for Locomotives.—The Russian Steamship and Railway Company announces that it has found the use of naphtha, for steam-generation with locomotives, very advantageous. The material employed by the company is the crude oil from the Caucassian and Volga regions, and, compared by weight, the amount consumed was about one-half that of coal. The arrangement for burning naphtha is stated to be of such a nature that no difficulty will be experienced in substituting one for coal consumption in place of it, should it be found desirable so to do.—*Van Nostrand.*

795. Adulteration in France.—The Tribunal of Correctional Police, Paris, recently tried two men—Crepin, a concierge, and Shiemer, for a new kind of adulteration. They had invented a substitute for coffee, which they called "exotic grains," and manufactured from the dregs of the real, purchased from cafes, mixed up into berries, and then roasted. The composition was sold to grocers at 1f. 60c. per kilogram, and the books of the defendants showed that a ton and a half had been disposed of in the trade. They were condemned to six months' imprisonment. Twelve grocers were at the same time condemned to a months' detention for selling coffee mixed with this compound.—*Jour. Soc. Arts.*

796. Air in Sea-Water.—Oscar Jacobsen.—An interesting, but lengthy paper. The proportion of carbonic acid appears to be very variable, and at great depths, *e. g.*, 2,000 fathoms, may exceed 30 per cent. Its amount seems connected with that of the saline matter. It cannot be considered as a free absorbed gas, like the oxygen and nitrogen, and can only be very imperfectly expelled by ebullition continued for an hour. An elaborate table is appended, showing the depth, the temperature, the percentage of saline matter, the amount of carbonic acid by weight and volume in a litre of water, and the respective proportions of the oxygen and nitrogen.—*An. der Ch. Ph.*

797. English Gas-Patent No. 3,275 of 1873, to G. King, Beckton, North Woolwich, Essex.—The object of this invention is to secure the lids of retorts and effect a gas-tight joint without the application of luting, and consists in making the lid of cast iron and inserting in a groove near its circumference a ring of steel of rectangular section, a portion of the ring being allowed to project and bear against the face of the mouthpiece. The lid has an inclined plane cast upon it, and is attached to a cross bar, which is hinged to the mouthpiece on one side, and falls into a catch on the other. A lever is pivotted to the cross-bar in such a manner that on being pulled it forces a wedge between the inclined plane and the cross-bar and so maintains the lid in close contact with the mouthpiece until the lever is moved in the opposite direction.—*Iron.*

800. Nickel.—Within the past three years, more especially since the discovery of practical methods for electro-plating with nickel, the demand for this metal has greatly increased, and its expense has become so great that a substitute for it in the arts is now sought. A good substitute, it is stated, may be found in the metal manganese. Dr. Percy, in a letter to the London *Times*, states that twenty years ago he made an alloy in which manganese was used in place of nickel, and the resemblance of the alloy to the ordinary German silver was perfect. Copper 75 per cent., manganese 25 per cent., makes an alloy resembling German silver, and better in its qualities. By the improved process of Hugo Tamm, manganese may be much more cheaply produced than nickel.—*Scientific American.*

801. English Gas-Patent, No. 3,183 of 1873, to J. R. Macfarlane, Manchester.—The object of this invention is to effect great economy in the consumption of the fuel used for heating the retorts, by enabling intensely heated air to be supplied or drawn to the furnaces. Instead of allowing the cold air to pass into the open ash pit, and between the grate bars of each furnace as at present, the front of the ash pit is closed, and the air is caused to pass through a horizontal flue on the top or in the interior of the horizontal chimney flue, through one or more vertical flues in the retort oven, and through one or more horizontal flues connected with the ash pit. The heated gases from the ignited fuel in their passage from the retort oven to the chimney flue and chimney, cause the chimney flue to be of a great heat, and much of this heat is given off to the horizontal air flue, and the vertical flue or flues in the oven are as hot as the retorts, and therefore after the air passes first through the horizontal air flue, and then through the vertical flue or flues, it becomes intensely heated, and the combustien of the fuel is effected without any check of cold air.—*Iron.*

802. Nickel Plated Speculum.—In a letter which Mr. Sidebotham had received from Professor Hamilton L. Smith, of Hobart College, Geneva, N. Y., the writer suggests the use of iron or bell metal specula coated with nickel, for reflecting telescopes. He says:

"I ground and prepared a bell metal speculum, which I coated with nickel, and this, when polished, proved to be more reflective (at least I thought so) than speculum metal. The two objects which I sought were, first, to have a polished surface unattackable by sulphuretted hydrogen (this, for example, is not injured by packing with lucifer matchhs), and, secondly, for large speculæ, doing the most of the work by the turning tool and lathe. I really think a large, say three feet, mirror, coated with nickel, but cast of iron, and finished mostly in the lathe, while it would not cost the tenth of a similar sized one of speculum me

tal, would be almost equal to silvered of glass the same size, and vastly more enduring as to polish.—*Sci. Am.*

803. Use of Monochromatic Light in Alkalimetry.—The difficulty of performing an alkalimetrical operation by artificial light has generally been considered insurmountable, since the changes of color in solution of litmus, or on litmus paper, cannot be distinctly recognised and the precise termination of the experiment cannot, therefore be determined. If, instead of ordinary gas-light, the laboratory be illuminated solely by a Bunsen burner, in the flame of which is placed a platinum wire covered with a suitable soda salt, such as common salt, red litmus will appear colorless as water, whilst blue litmus is black as ink. In this light, therefore, the change of color, which indicates the termination of an acidimetrical or alkalimetrical process, will be seen more distinctly than by daylight, and these operations can, therefore, be conducted in the night better than by day.—*Iron.*

804. The Transit of Venus.—Prof. Henry, of the Smithsonian Institute, Admiral Sands, and Professor Newcomb, of the Naval Observatory, were at the Navy Department to day, with the view of making preliminary arrangements for the details of the different departments of an expedition to be sent in a vessel of war to various points to take observations of the transit of Venus. The points it is contemplated visiting for this purpose are mainly in the Southern Indian Ocean, Australia, and the adjacent islands. There will probably be four parties, six persons in each, to be assigned at different points. The Western party at Hobartstown, Van Dieman's Land; a second party at Kerguelan's Land, in the South Indian Ocean; a third party at Vladistooak, on the Asiatic coast of Russia, and the fourth at some island adjacent to Australia. It is hoped that full preparations will be completed for this scientific expedition, so that if the Department shall consent to furnish a vessel of war they may leave one year hence.

805. Solar Heat as a Tool.—During the recent building of a bridge in Holland one of the traverses, 465 feet long, was misplaced on the supports. It was an inch out of line, and the problem was how to move it. Experiment proved that the ironwork expanded a small fraction of an inch for every degree of heat it received. It was noticed that night and day temperature differed by about 25 degrees, and it was thought this might be made to move the bridge. In the morning the end out of place was bolted down securely, and the other end left free. In the heat of the sun the iron expanded, and towards night the free end was bolted down, and the opposite end was loosened. The contraction then dragged the whole thing the other way. For two days this experiment was repeated, till the desired place was reached.

We find no record that the heat of the sun has ever been employed in this way before, but the contraction and expansion of iron bars by fire-heat has already been used to move heavy weights over short distances. Broken walls and strained roofs and arches have been brought into place by simply heating iron rods till they expanded, then taking up the slack by screws and nuts, and allowing contraction by cold to pull the wall or roof into place.—*Iron.*

806. The Velocity of Light.—M. Fizeau, has lately published (*Les Mondes*) the results of a series of very elaborate experiments, made with a view to the most accurate determination of the velocity of light.

The source of the ray was a jet of oxyhydric gas, and the distance between the two stations, as found by careful triangulation, was 33,827·1 feet, with a probable error of 0,001. Six hundred and fifty satisfactory observations were made, the mean of which, multiplied by the index of refraction 1·000 3 gave 185,386 miles per second as the velocity of light to an approximation of 0·003. This result agrees with that previously determined by Foucault, and also confirms the value of the sun's paralla (8" 86) obtained by La Verrier.—*Jour. Franklin Inst.*

807. Building Stone and Fire.—In a paper recently read before the Polytechnic Club, of the American Institute, of New York, Dr. Adolph Ott stated that limestones containing magnesia, or as they are termed "dolomitic limestones," are even less fit for building materials than ordinary limestones, which, as we know, stood the heat worse in the extensive conflagrations in Chicago and Boston. As our Westchester and also Vermont marble is a dolomitic limestone, this fact is of very great interest for this city. It is furthermore stated that the various sandstones stood the heat best, owing to the fact that their predominant ingredient is quartz, a substance well known for its infusibility. Dr. Ott explains also why granite, gneiss, mica-slate and other rocks, belonging to the primary formation, readily crack and explode, even when only exposed to the radiant heat of neighboring buildings. This is due to the moisture they contain in their interior, a fact well known to quarrymen. Regarding the artificial Portland cement stone, now coming so largely into use, we possess in it a material in every respect suitable for building purposes. Being a compound of sillicate of lime and alumina, it will stand heat almost if not quite as well as sandstone. —*Iron Age.*

Gas-Cooking Stoves at the London Exhibition.

Among the cooking stoves in which gas is employed, those manufactured by Messrs. S. Leoni & Co. (No. 4,727) are specially noticeable though it is certain that the advantages claimed for gas when used for cooking are not as great as its advocates would have us believe, there is no real doubt that, if properly used, it may be made more economical than coal. The chief gain is, that there is little or no heat wasted. The exact amount required can be obtained at once, without waiting for the fire to burn up; and when the work is done, the gas can be turned off, and there is no waste while the fire is burning out. Again, it is infinitely cleaner than coal, and the heat can be exactly regulated to the various processes of cooking. Against these advantages must be set the fact, that if used wastefully—as household servants would be apt to use it—it is certainly not cheaper than coal, as a given value of coal will produce a greater amount of heat than the same value of gas. In fact, the case may be summed up thus:

Gas, carefully and properly used, is cheaper than coal; wastefully, it is dearer. It is cleaner; for many purposes it is more convenient, and all cooking processes can be accomplished by it.

The earliest patent on the subject was taken out in 1831, by Robert Hicks; eighteen years later, 1849, D. O. Edwards took out another patent, in which the gas was mixed with atmospheric air before combustion, and it is this principle of mixing the gas and the atmospheric air, so as to obtain heat, not light, upon which all gas stoves have been founded. The principle is, of course, merely that of the well known Bunsen burner, with modiffcations.

In Leoni's apparatus one great desideratum has been attained, that of perfection of ventilation. All fumes and vapors are carried away along the flue, and one great drawback to the use of gas as hitherto employed, is avoided. It is also arranged so as to be capable of cooking on the largest scale, as is shown by the results at the London Hospital, the Kitchen reports of which state that an average saving in meat (as shown by the loss of weight in cooking) is about 20 to 25 per cent. as compared with the old system, and that an absolute saving of £500 in the butcher's bill for a year has been effected by the gas stove.

Among the experiments that have been made with one of Leoni's apparatus (a kitchener for family use) is the following:

Breakfast for five adults and three children—2 pints of coffee, 1 pint of tea, ½lb. of bacon, ½lb. of oatmeal for porridge, 6 rounds of toast; time, 20 minutes; consumption of gas, 12 feet (less than three farthings.) Dinner for twelve adults and three children—6 lbs. leg of lamb (loss 1½ lbs.), 4 lbs. sirloin beef (loss 10 oz.), 5 lbs. of potatoes, 6 large cauliflowers, 2 large fruit pies; time, 1½ hours; consumption of gas, 18 feet, (2¼d.). This economy of fuel is mainly effected by the ingenious arrangement for reflecting an utilising the heat—arrangements which reflect special credit on the invention. A smaller apparatus is calculated to do all the cooking for a family of twelve persons, at a cost of 36s. per quarter, or 1¾d. per day, estimating the price of gas at 4s. per 1,000 cubic feet. These facts speak for themselves, and show how great improvements can be effected by careful scientific appliances, for it is economy in the use of fuel, not cheapness in the fuel itself, that is the chief advantage of these new stoves. Besides the larger cooking apparatus, Messrs. Leoni show some very convenient and handy appliances for cooking on a small scale. These might well be introduced into houses where the use of gas for general cooking purposes is impracticable from previously existing arrangements.—*Journal of the Society of Arts.*

Gramme's New Electric Light.

Some experiments have lately been made in the Westminster Bridge-road with a new electric light, developed with a new magneto-electric machine, the invention of M. Gramme, of Paris. M. Gramme has been engaged in the French capital for a number of years in the works of the "Alliance," where he had great facilities for perfecting his ingenious invention. The Committee of Industry of the Academy of Science, after having put it to a severe test, awarded him the prize of 30,000 francs, and it is at present being rapidly introduced in France.

The difference between the Gramme and other machines lies chiefly in the application of rotary, instead of reciprocating magnetism. The construction is briefly as follows: "A ring of soft iron encircled with an endless coil of copper wire is rotated between the two poles of a strong magnet; that half of the ring which is in proximity with the north end of the magnet takes south polarity; whilst the opposite half, near to the south end, takes north polarity; the two neutral points of the system being equidistant on each side. When the iron ring with its wire convolutions is rotated, the polarity of the ring remains unchanged in position in regard to the operator, so that the action is equivalent to the coils alone being rotated over a stationary ring-shaped magnet. The effect of this is to produce currents in the two halves of the ring, in opposite directions, between its two neutral points. At these points, however, contacts are placed, which touch in succession a series of studs, in connection, at regular intervals, with the wire coil, so that the opposite currents in the two halves of the ring, instead of neutralizing each other, join together and form a single current." In the course of the experiments the machine, which was driven with about 2½ horse power, did its work in a most satisfactory manner. A copper wire, about 1¼ milemeter in thickness, was suspended between the poles, and became red-hot with a revolution of little over 300 in a minute. The 2½ horse power is sufficient to produce an illumination equal to 8,000 candles.

The *Daily News*, in reporting the experiments, says: There was some facility given for testing the accuracy of the statement in a small street running into the main road. The carbon points had been placed at the end of this street, and at the application of the current, an intense light was thrown on the shed at the opposite end, a distance of about 300 yards, which illuminated every object within that space with a painful brilliancy. At that distance it was not only quite easy to read the smallest print, but the flame of an ordinary gas lamp threw a distinct shadow upon the board behind it. At the same time the light burned with a steadiness which we have never seen equalled in any other magneto-electric machine, partly in consequence of a very delicate piece of machinery, also a new invention, by which the carbon points are always kept at the proper distance. It is obvious that the cost of the light can be easily ascertained, as it consists simply of the Gramme machine, the steam engine and the cost of its working, and the trifling cost of carbon. These being all the requisites, we imagine that the estimate of two shillings per hour is a good deal beyond the actual experience. Larger machines are now being made that will easily throw a light equal to 25,000 candles at a comparatively smalle expense, and it is said for a distance of thirty miles. The small compass of the whole apparatus renders it of great use, not only to lighthouses, but to large ves-

sels, which will be able to make themselves seen for a safe distance in a dense fog. By the application of the current, pig iron can also be freed in a very short time of all noxious elements, and turned into steel in something less than an hour.

Experiments have also been made with this light, with a view to adopting it on the clock tower of the Houses of Parliament, and it is probable that it will ultimately be used for this purpose.—*Journal Society of Arts.*

Pennsylvania's Coal Supply.

The Pittsburgh *Commercial* does some figuring upon the extent of the coal supply of Pennsylvania to the following effect:

The census statistics show that in 1870 Pennsylvania mined and sent to market 7,800,000 tons of bituminous coal, all of which came from the western part of the State, and the census is not regarded as showing the full amount so mined. Its figures are approximate, only, and it is therefore safe to assume that the mining is at the rate of 9,000,000 tons a year. A ton is, in round numbers, 30 Bushels. The total yearly product of bituminous coal in Western Pennsylvania is, therefore, 270,000,000 bushels. An acre of coal is variously understood to yield from 80,000 to 100,000 bushels; but fix it at the highest figure, and say that an acre will average 100,000 bushels, and this yearly drain will be seen to exhaust 2,700 acres. This, in 10 years, will amount to 27,000 acres, and in 100 years to 270,000 acres; but it is not supposable that a trade which seems only in its infancy, will stop at the figure now attained.

In ten years from now, from present appearances, the product of 1873 will be doubled, and in less than thirty years quadrupled; so that, probably by the opening of the twentieth century, Pennsylvania will be using up 10,000 acres of coal yearly. The area of the coal fields of Western Pennsylvania, says the *Commercial*, is probably less than 5,000 square miles. "This is a large area, and no one now living need fret about its being exhausted in his day or that of his children or grandchildren; but still, if we are now using five square miles yearly, and go on steadily increasing to ten, twenty and forty square miles yearly, it is easy to figure out the exact limit of the supply. Even now, the cost of bringing it to market is so much increased that we may safely conclude that the days of cheap coal are over. We shall never again see it as cheap as it has been. As the river hills become exhausted, and the tramways have to be extended still further back, and timber grows scarcer and scarcer, and lumber dearer, the cost of putting it on the market must steadily increase. The sum of it all, then, is that while we have plenty of coal to last us for hundreds of years to come, the supply is not inexhaustible; and that, as the near-at-hand supplies are being rapidly used up, the more distant supplies will cost more to deliver. There is no danger of a famine for a long time to come; but there is, on the other hand, no prospect of cheaper prices in the future."—*Iron Age.*

Health (?) of New York City.

The New York *World* thus sums up (June 16) its extensive and praiseworthy investigations in this fragrant field of research:

1. The city of New York in too many of its parts is drained by sewers laid without regard to the fact that water runs down hill. Where the local springs have refused to co-operate with the city engineers, the city engineers have plastered them over with earth and founded street systems upon these morasses that quake with their pent-up poisons. To parody the Roman satirist, they made a swamp and called it a city.

2. Over the greater [illegible] of the city and in some districts over just such a [illegible]-plaster of poison has been laid the cobble-stone pavement, which possesses all possible ugliness with no compensating utility. Under the most favorable conditions depressions are rapidly formed in its surface, wherein is stored up the unspeakable filth of the streets, there to fester and ferment into poisonous gases in the sun and rain, or in the parching winds of summer to dry into a dust which may become an even more subtle agent of contagion, and make a trivial gust upon the street, as fatal as a flight of Indian arrows dipped in *wourali*.

3. A few streets are tolerably swept, but none better than all should be. The rest of the streets, from year's end to year's end, are never adequately cleaned. The senses are offended by square miles of slimy garbage rotting in the gutters, greasy currents of filth flowing over the sidewalks, lanes which are canals that might flow into Malebolge. Through these potter the paralytics to whom the cleaning of the city is intrusted, feebly stirring up the pollution, lest an atom of its poison should remaid unbreathed, or removing it from one street to strew it impartially along the next.

4. Some of these streets have a population of 300,000 to the square mile, and many of 190,000 to the square mile, while sanitary authorities declare that but one-fourth of the smallest amount can with safety be housed within such a space. Crowded in quarters as foul as the *ghetto* of Rome, the St. Giles of London, the slums of old Paris, the poor swelter in dirt and disease, and die prematurely like rotting sheep.

5. Round the whole city ebbs and flows a stream of filth, which neither the tide nor the current can remove, and which settles on the shores and about the docks till it is covered by later accumulations.

6. Under the whole city runs a network of sewers, pulsating with poisonous gases. The air when the tide is out, the water when it is in, like a huge piston forces the fateful fluid through the sewers, drains, pipes, and traps. The pulsion reaches the homes of the poor and the dwelling of opulence, where cleanliness and comfort are fondly believed to rule; it lifts with a visible force the column of water vainly interposed to stay its progress; it enters the house and reads its occupants the lesson that neither in Fifth avenue nor the Five Points can a vitiated atmosphere with impunity be breathed.

7. The fruits of this coupling of individual carelessness and official incapacity are written in every cemetery. Annually are filled 300,000 sick beds and 11,000 graves which should remain untenanted. The equal step of death treads alike the mansions of the rich and the hovels of the poor.

Since the reader took up THE WORLD one victim has been slain by the insatiate pestilence and thirty-four others have been seized with sickness not sent of God. Every forty-six minutes, day and night, we sacrifice a life to our municipal Moloch. Thus are *thirty-one* lives taken daily, taken inexorably, lives of the innocent and the helpless, lives of those whose only crime is that they live in New York in the consulship of Henry Smith.

On the Action of Water on Lead.

By SIR ROBERT CHRISTISON, Bart.

The most general results of the author's former inquiries are:

1. That the purest waters act the most powerfully on lead, corroding it, and forming a carbonate of peculiar and uniform composition.

2. That all salts impede this action, and many prevent it altogether, some of them when in extremely minute proportions.

3. That the proportion of each salt required to prevent action is nearly in the inverse ratio of the solubility of the compound which its acid forms with the oxide of lead.

The effect of certain inorganic ingredients of water in modifying the preservative power of the salts the author did not investigate. This has been made the subject of numerous inquiries and observations by others, chiefly, however, of a desultory nature, some of them much too succinctly described, and some also, of questionable accuracy.

It has been denied that water acts by reason, and in the ratio, of its purity; and it has even been alleged that distilled water itself does not act if really quite pure. The author has, however, invariably found the reverse to be the case, and can assign no other explanation of these statements, except some error in manipulation. For example, a very pure spring water was sent to him from the south of England, with the assurance that it had been found found incapable of attacking lead; but, on making trial of it, he found it to act with an energy not inferior to that of distilled water.

It has also been stated that ordinary distilled water is apt to contain a trace of nitric or nitrous acid, from nitrates incidentally present in the water subjected to distillation; and that such water, if distilled after the addition of a little potash to fix the acid thoroughly, yields a distillate which has no action upon lead. But when the author prepared distilled water in this way, with great care to prevent the access of impurities from other sources, the only result was that the action was even stronger than that of the laboratory, and greater, indeed, than he had ever before observed.

An interesting statement has been made by Dr. Nevins, to the effect that some salts appear to allow of a certain action going on when they are present in water largely, although their influence, when they exist in very small quantities, is to act as preventives. This result the author has sometimes obtained, and has found the action such as might prove dangerous. But its limit requires to be defined; and there is reason to suppose that the proportion required to *permit* action will be found to be greater than is ever likely to occur in the instance of waters applicable to household use.

It has also been said, but in general terms and without experimental proof, that the presence of carbonate of soda, even in a hard water, takes away the preventive influence of the other salts, and enables the water to dissolve lead. There appears to be some foundation for this statement; but, here, too, it is necessary to fix what is the limit to such influence before its importance can be valued. Moreover, as bicarbonate of soda appears to have no such effect, and this is the usual form of the carbonate in natural waters, the practical importance of the fact is inconsiderable.

The corrosive action of water upon lead has often been confounded with other causes of corrosion, and the water has borne the blame. Thus the true action has been confounded with the corrosive action of potent agents, accidentally coming in contact with the metal in the presence of water, as, for example, when a lead pipe has been led through fresh mortar, which is frequently or permanently kept moist, or when lumps of fresh mortar have been allowed to fall upon the bottom of a lead cistern.

The true or simple action of water has not unfrequently been confounded also with the effects of galvanic action. Thus, if a lead pipe or cistern be soldered with pewter solder and not with lead, erosion takes place near the line of junction of the solder with the lead. The presence of bars of other metals crossing lead, or bits of them lying on it, will also develop the same action; and some facts seem to point to the same property being possessed in a minor degree by some stony and earthy substances. This observation may explain the local erosion sometimes observed in cisterns containing hard water; since, if galvanic action be excited, it will be increased by the fact of saline matter existing more largely in these waters than in soft or comparatively pure water.

Lastly, some observers have contradicted former statements, because under certain circumstances, which led them to anticipate no action, they nevertheless found lead in water, but only in extremely minute and unimportant proportion. The test for lead, hydrosulphuric acid, when employed in the way now usually practised is so delicate as to detect that metal when dissolved in ten million parts of water, or even more. Facts, however, warrant the conclusion that the impregnation must amount to at least ten times this quantity before water can act injuriously on man, however long it may be used.—*Iron.*

Is It Safe to Drink Hard Water?

There is a popular prejudice that hard water is dangerous to the health, and on that account we are constantly warned by physicians to beware of it, but in England one of the leading authorities on this subject, Dr. Letheby, after devoting many years to an investigation into the properties of the water introduced in to English cities, and to a study of the sanitary reports on the subject, comes to the conclusion that moderately hard water is safer and more healthful than soft water. Hard water is not only clearer, colder, more free from air, and consequently more agreeable to the eye and to the taste than soft water, but is less likely to absorb organic substances, to sustain the life of zymotic organisms, or to exert solvent properties upon salts of iron or upon leaden conducting pipes. The lime salts exert a beneficial influence upon the animal economy, and even protect the system from dangerous outward influences. Dr. Wilson, of Edinburgh, has also collected much valuable material on the subject,

and comes to the same conclusions as Dr. Letheby. He takes the ground that the human body requires for its nourishment and support a supply of certain mineral salts, among which carbonate and phosphate of lime play an important part in building up the compactness of the bones and in other functions. We usually obtain phosphate of lime in our animal and vegetable food, but not from the water we drink. Carbonate of lime, however, is not contained in adequate quantity in our solid food, but generally obtains in spring and well water.

It has been incontestibly shown that in mountainous districts, where the water is more or less hard, the inhabitants exhibit the best physical development. On the other hand it is believed that in large cities the mortality is inversely as the hardness of water supplied to the inhabitants. A water which contains about six grains of carbonate of lime to the gallon is suitable for use in household purposes. As a drink and for cooking food, such a water offers the necessary carbonate of lime for the support of life in the simplest, most natural and most easily digested form, and is at the same time more agreeable, fresh and sparkling. It is evident that our preconceived popular notions on the subject of hard water need revising, and that it may be better to have recourse to rain or ice water.—*Jour. Applied Chem.*

Correspondence.

[Correspondents, in all cases, should sign their communications with their names and address in full—not necessarily for publication, but as a guarantee of good faith.—Ed.

☞ Notice.—Correspondents not intending their letters for publication must mark them "Private."

Enrichment.

Newark Gas-Light and Coke Co.
Newark, Ohio, May 20, 1873.

Mr. Editor: It is claimed that the use of naphtha for manufacture of gas is not as successful as was anticipated, in consequence of filling up the small pipes with a resinous looking substance, which partially stops the flow of gas, and that some works which were using the naphtha gas process have adowted cooal. Is this a fact? and, if so, how do you account for the resinous deposit in the pipes? has the mixture of atmosphere with the rich gas anything to do with it? I was informed that Saratoga, N. Y., (perhaps the first works of any size to adopt it) have also changed to coal. I should be pleased to hear your opinion in your valuable Journal, regarding the possible failure of naphtha Gas, and causes leading thereto.

Yours truly,
Jas. H. Smith, Supt.

[To the letter of our esteemed correspondent from Ohio, the Editor desires to say that he is glad of the opportunity. The delay in reply has not been due to neglect of consideration of the important questions covered by Mr. Smith's letter. Every facility for investigation that could be found has been availed of. Certain things have been learned, and other things unlearned. All investigators (entitled to the name) will have this same experience.

The Editor intends to say but a few words now, as this is a subject big with future promise. It may do to say now, however, that the *dangerous* days of "Naphtha Gas" are over, but the outlook is that common crude petroleum will be the agent used in the *enrichment* of coal-gas in the near future. The practical difficulties, some of which are referred to by Mr. Smith, appear to have been practically overcome.—Ed.]

Waters of Prince Edward Island.

There is probably no city of ten thousand inhabitants on this continent, that is suffering more for want of pure water, than Charlottetown, the capital of Prince Edward Island. The public and private wells of this city are unfit for use from the presence in them of animal matters in uncommonly large proportions, and they undoubtedly constitute the primary cause for some of the diseases prevailing among the people there. The inhabitants of this city are literally "dependent upon a water cart or two and a spring just out of the city limits, for every drop of water fit to use for cooking or drink;" and this water, which is itself not by any means one of the best, is sold from the carts for nearly one cent per gallon. For more than two years the city council have had this matter under consideration, and the first complete analyses of their waters were made in November, the sources of the different specimens being unknown at the time. In recording only partial results of these analyses, it should be understood that the constituents, called *organic matter*, consist of the volatile matters after correction and deduction of carbonic and nitric acids, water of composition, etc., belonging to the mineral and saline constituents determined by full analyses.

One United States gallon (231 cubic inches) of these waters contained in grains

Source of Water analyzed.	Inorganic matter.	Organic matter.	Total weight of residue.
City pump well	50·61	5.95	56·50
Park spring	5·05	3.17	8·22
Winter river, 6 miles from the city	4·21	2·46	6.67

The well water contained nitrate of potash in sufficient quantity to admit of its separation by crystallization; and the predominating constituent in the residues from the other specimens was sulphate of lime. There is now every reason to suppose that the water of Winter River will be brought into Charlottetown before long, through a proper system of supply pipes, although the same partisan feeling on the "water question" finds expression there as elsewhere.—*S. Dana Hayes, Amer. Chemist.*

PRICES OF FOREIGN AND DOMESTIC GAS COALS.

[Reported Expressly for this Journal.]

JULY 16, 1873.

DELIVERED IN NEW YORK.

English Cannel.			
Ince Hall	$17 00	@	18 00
Kirkless Hall	16 50	@	17 00
English Caking Coals.			
Newcastle Gas	$12 00	@	00 00
Liverpool caking	11 50	@	12 00
British Province Coals.			
International—At Sydney, $2 50 in gold			— —
Block House—At Mines, $2 50, Gold			0 00
Little Glace Bay—At Mines, 2 50 Gold			— —
Pennsylvania Coals.			
Penn Gas Coal—At Amboy	$8 50	@	0 00
Westmoreland—At Amboy	8 50	@	0 00
(In New York both the above coals $9 10)			
Shafton	9 10	@	0 00
Youghiogheny—At Baltimore	7 50	@	0 00
West Virginia Coals.			
Murphy Run	$7 50	@	8 75
Despard—At Baltimore	6 50	@	0 00
West Fairmont	8 60	@	0 00
American Gas Coal	8 50	@	0 00
Fairmont	8 50	@	0 00
Newburgh Orrel	8 50	@	0 00
Pinnickinick	8 50	@	8 75
Cloverhill of Virginia	6 75	@	7 00
McKenzie Compound Mixture			— —
American Cannel Coals.			
Peytona of West Virginia	$15 50	@	00 00
Darlington of Pennsylvania			— —
American Cannel	$14 00	@	00 00
Asphalts.			
Albertite of New Brunswick	$— 00	@	— 00
Ritchie Mineral of West Virginia	20 00	at Bal'e.	
Trinidad Bitumen	— —	@	14 50

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COLBURN.—The Gas Works of London, 12mo, boards. Price, 60 cents.

GAS CONSUMERS' GUIDE.—A Hand Book of Instruction on the proper management and economical use of gas, etc., etc. 12mo., cloth. Price, $1.00.

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D'HURCOURT.—De l'Eclairage du Gas. Par E. R. Hucourt, 3d edition. Paris, 1863; 8vo. and plates, $6.00.

RICHARD.—Gas Consumer's Guide, 12mo. Price, 50 cents

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WEDNESDAY, JULY 16, 1873.

WISHING TO MAKE THIS JOURNAL an organ of intelligent discussion to those of our readers who may wish to gain or give information on the subjects to which its columns are devoted, the publishers solicit letters from all among them who make the study of these subjects a pleasure, or a profession.

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IS THE USE OF GAS DANGEROUS?

Some subjects—topics only of common conversation—it is the safest and wisest course to let alone. They soon wear themselves out and are forgotten. Others which, in various ways, are kept before the public, may not in reality be of much importance, and yet ought not to be permitted to pass unnoticed. These things which are least understood, almost always create the strongest prejudices; and as long as ignorance remains, the prejudices are perpetuated. It seems as if some of these prejudices would never die out. From time to time they are revived, repeated, and republished with all the oraculousness of new discoveries. After making large allowance for defective information, for official bias, and for probably something akin to disinclination to examine all sides of a question, I cannot but think it unfair, so unfair as to amount to injustice, for anyone to talk and write authortatively about gas-lighting being dangerous.

Of all classes of statistics, those professing to explain the causes of the fires which actually occur in the metropolis are the least satisfactory. No doubt great care is exercised in collecting information, and all that can be done is done in trying to get at the truth. Whatever may be the proportion of fires actually chargeable to the use of gas, those which are accidental, or in a certain sense, unavoidable, ought to be distinguished from those occasioned by wilful carelessness and culpable negligence. In the latter cases, the persons who have misused or misapplied the gas have been "dangerous," and not the gas itself.

All kinds of combustibles are dangerous. Fire in its various forms, without flame and with flame, and whether employed for heating or lighting is dangerous. Open fire-places, enclosed stoves, heating by air and water, ovens and furnaces, gas-lights, lamps, candles, and lucifer matches are dangerous. Who, in his right senses, will deny this? But with so much dangerous materials, and dangerous processes about us, the world has gone on; and the accidents, costly and calamitous as some of them have been, are, comparatively, few in number.

In the use of heating and light-giving materials, and in their application to the innumerable processes of trade, manufactures, and social life, what is it that constitutes immunity from accidents? It is not because some of the materials are more easily managed than others. In themselves they are as dangerous, but in their application the elements of safety greatly outnumber those of danger. In actual everyday practice, it is next to an impossibility to derange or interrupt the successful operations of some kinds of combustible materials; while others are at any moment liable to go wrong, and, with the most attentive supervision, they often do go wrong.

In helping to promote the the use of gas, the question uppermost in our thoughts, has been, not whether gas is dangerous, but whether in its right application, it is attended with fewer risks of accident, than any other material. This question has long been settled. We believe it to be impossible to over-estimate the benefits of gas, when comparing or rather contrasting it with other light-giving materials, and solely on the principle of safety. If all the ordinary kinds of light-giving substances are more or less dangerous, is it not reasonable, as well as desirable, to make a selection? This has been done. The public—manufacturing, commercial, and social—have declared in favor of gas; and to an extent which probably will never be, even approximately, represented by figures. What avails it to try to resuscitate old fashioned and obsolete prejudices? Who will listen to them, or who will believe in them?

Gas-lighting must not be looked at hastily, nor only in the commonest and most familiar aspect, if we would come to a right conclusion as to its superiority in respect to safety. A good-sized well-lighted shop, or warehouse, or manufactory, or printing office, or private dwelling, is an example of the advantages of gas under favorable conditions. In passing along the streets, the thousands of burners of various forms and sizes, which are seen so closely mixed up with fragile and combustible materials, may seem to convey a notion of danger. But it is not so. Accidents from such causes are extremely rare. Practice and experience may be relied on. The risks are smaller than they appear to be.

Those who wish to magnify, or as we ought to say, exaggerate, the dangers of gas-lighting, should dive below the levels of the streets, and witness what is going on in vaults and cellars, kitchens and workshops, packing-rooms and warehouses; where the floors are strewed with paper, straw, and shavings, and every available space filled with bales, boxes, and casks; whose contents, in many instances, are so inflammable, and a hundred times more inflammable than the gas which illuminates them. Here it may be well to remember the class of persons to whose care and management gas-lights are intrusted; many of them but lately arrived in the country, who have to light and put out the gas, although they may never have done so before.

If further proof be needed that gaslighting is not dangerous, let us think of the piles of buildings in the manufacturing districts, and the processes carried on in them; where the number of burners, and the gas consumed in one of them is equal to that required in a moderate-sized town. We may also try to think of the probable number of burners, the thousands of millions of cubic feet of gas, and the quantity of light obtained from it; and then we may ask where the tallow, or oil, or other materials are to be obtained to supply its place with light so pure, and so free from danger.

HINTS ABOUT GAS.

Much dissatisfaction, annoyance, and useless expense may, and but too often occur, through want of knowledge of some simple facts connected with the management of gas; unfortunately these evils are frequently aggravated because gas fitters, to whom the people look for aid, are often unacquainted with the various contingencies which occur on the introduction and burning of gas.

It is a common occurrence for consumers to complain of the excessive cost and deficiency of light. To the inaccuracy of the meter they generally attribute the former, and to the poor quality of the gas the latter condition is usually charged; where, in reality, the fault will be found to rest with the consumers themselves, through their own ignorance and mismanagement.

Whenever light is obtained from gas at a greater cost than necessary, it is just as much a loss as to permit any other valuable commodity to run to waste. And a proper knowledge of the conditions that cause unnecessary loss, will place in our hands the means requisite to avoid and prevent it.

There is no part connected with the consumption of gas, whereby the best results are obtained in the quality of light and economy of gas, of more importance than the burners.

It would be difficult to convince the majority of gas consumers, who have not given the subject attention, how remarkably the light derived from gas is reduced by improperly constructed burners, or where the pressure of the flames is unsuitably adjusted. Owing to these circumstances, the amount of gas consumed is disproportionate to the light obtained, and the account of the consumer is much increased. In fact, there is no exaggeration in stating that a large proportion of the consumers, through their own mismanagement, pay twice as much as there is any occasion for, considering the amount of light obtained, all of which could be saved by using a proper burner, and a correct adjustment and control of the pressure.

The most important requisite for good burners is that the orifices where the gas issues should be perfectly regular in size, and of a proper size to permit it to issue within very low pressure. And these conditions should be adhered to, whatever the kind of burner may be, whether the argand, batwing, fish-tail, or single jet, etc.

If the orifices are too small a high pressure is required to expel the gas, and the light is furnished just in proportion to the increased pressure. In such burners the flame will have a blueish tinge, and the lower part will be of a deep blue color, giving but little light in proportion to the gas consumed. As an example, an argand of fifteen holes passing five feet of gas at 1-10th pressure, yielding a light of twelve candles will, if the orifices are reduced, to pass the same amount of gas per hour at 5-10ths pressure, only give the light of six candles—showing a loss of 50 per cent. Here we see that the light to be obtained from a given quantity and quality of gas is entirely dependent on the burner employed. This demonstrates the necessity of having proper burners, and shows clearly how by negligence on this point, the consumer may find his gas bills increase, in what appears to him a very mysterious manner.

It is a mistake to suppose that the amount of light obtained will be in proportion to the quantity of gas issuing from a burner. There is a particular point in the consumption of any class of burners where the maximum of light is derived, and any deviation from this entails loss.

A five feet batwing or fishtail burner will give a maximum of light in proportion to the gas consumed, compared with any less sized burner, and it will be found in practice the larger-sized burners are the most economical. The larger sizes giving as high as 200 to 300 per cent. advantage in light as compared with the smaller sizes.

The knowledge of these facts of importance to the consumer, who may, in his endeavor to economize, obtain results directly opposite to his anticipations. It is therefore more economical to have one good large gas light than several small ones. Consumers if governed by these hints will find it to their advantage and have less grounds for complaint against gas companies.

NOXIOUS VAPORS AND WATER.

There are some scientific truths that at times become of vital importance, and if not recognized, or known, and not heeded, may imperil health, or life itself. Among these we may place the fact that water will absorb in large quantities most noxious gases, particularly those most injurious to human health. As the quantity absorbed is much greater as the temperature of the water is lower, it follows that the water will absorb such offensive matters most abundantly; that the gases liberated during animal decomposition and from excrementitious matters of animal origin may be, and often have been, the cause of disease, is another dangerous truth equally certain.

Water that has once become infected by exposure to such contaminating agencies could hardly ever again be rendered fit for culinary or drinking purposes. Though pure to the eye it would always be powerful to extend the ravages of epidemics like the cholera now threatening our country. It would be incredible to suppose that any one convinced of these truths would, intentionally, place the water cooler intended to supply his family and friends with water for daily drink, in the water closet of his dwelling. Still more incredible if the water closet, instead of being the cleanly apartment of a well-regulated household, should be polluted by everything vile and disgusting. And yet this is daily done by several railroad corporations, who through ignorance or carelessness, have been betrayed into this gross violation of the laws of hygiene. The railroad car may be fitted up with the most elaborate care for the convenience of of travellers by day or night, yet if wanting in a fitting supply of clean water for drinking, it is deficient in a most important item for comfort. The builders and buyers of such cars seem to be restricted to the one idea—to economize space—and make room for one more seat that will hold two more passengers, they have agreed to stow away the water cooler in a corner of the water closet, with the spigot projecting through the partition. here the public are enabled to help themselves to a glass of ice water, and enjoy the draught, provided they are blissfully ignorant of all its antecedents.

The condition of the water closets on our railroad cars is too well-known to need description. The water cooler with its ice cold fluid and closely fitting cover, is surrounded by an atmosphere abundantly supplied with gaseous exhalations of the most repulsive character—and the water charged with these gases is swallowed by the most fastidious—even those who are too delicate to use the common glass, will fill their silver mugs and swallow the vile fluid with an apparent relish. Will not the travelling public insist on the proper remedy for this great nuisance.

SMEDBERG'S "SYNOPSIS OF BRITISH GAS-LIGHTING."

It is with a degree of pleasure that we have to announce to subscribers to the above entitled work that we have just received a letter from Mr. Smedberg in relation thereto. He states that owing to a difficulty in obtaining duplicates of wood-cuts from England, the work has been *unintentionally* delayed, but now assures us that no further delay will occur, as the body of the work will be put to press between Aug. 1st and 16th, and that the first part will be ready by November 1st.

In view of this we would suggest to all gas men and others interested in the manufacture of gas, who have not already subscribed to come forward, as only a limited number of copies will be published. To use Mr. Smedberg's own words "there will be no disappointment this time."

☞ We devote a large space of our present issue to illustrating the various patents for charging and drawing retorts by macoinery, which we trust will be read with interest by the gas fraternity.

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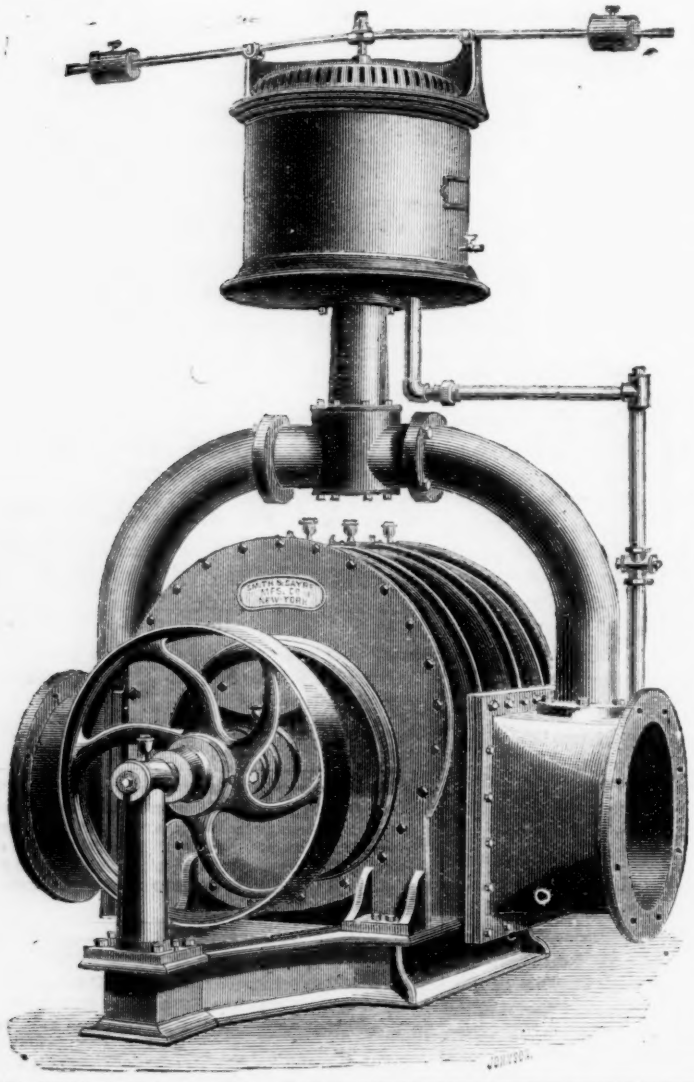

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TO GAS-LIGHT COMPANIES.

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The Screen is made with an oak frame, interlaced with split rattan, drawn through holes at regular intervals in the Frame and cross-pieces, the edges of the frame being grooved to prevent abrasion.

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4te Their cheapness and simplicity of construction.

5th. Their DURABILITY—they can be used longer than any other now used.

Testimonials.

PROVIDENCE, RHODE ISLAND, March 21st, 1872

E. DUFFEE, Esq., Agent, etc.

Dear Sir: The Trays manufactured by you for our West Station were put in use in September last, and have *given perfect satisfaction.*

The frames are well put together, and I see no reason why ey will not last for a long time. The *very large amount of n space* in these Trays gives the gas an easy passage, and brings it into contact with the lime much better than when the space is so contracted, as is the case in most of the other Trays in use.

The pressure thrown upon the retorts by contracted passages is very great, and were gauges used more frequently than they now are in many gas-works, this facat of having *open Trays* would become more apparent to mangers of gas works. The digerence in pressure at this station in passing the gas through your purifiers, is two-tenths (2-10) inches.

The amount of gas purified, per bushel of lime used to this date, is six thousand five hundred and fifty six (6,556) cubic feet.

Respectfully yonrs,
JAMES H. ARMINGTON, Supt.

BOSTON GAS-LIGHT CO., Dec. 1871.

Dear Sir: In answer to your inquiry how we like your Patent Tray for dry gas purifiers, I take pleasure in saying we have used them exclusive of all others, for the last three years, and think them far ahead of any yet offered. The surface being nearly three times that of any other Tray, and their lightness and durability perfectly satisfactory.

Yours respedtfully,
A. M. GILES.

EDWARD DUFFEE, Esq.

EAST BOSTON, JUNE 15, 1871.

Gentlemen: We have used your Screens some five years. They give perfect satisfaction.

I consider them *by far the best Screen* for Dry Lime Purifiers I have seen. Yours truly, A. M. NORTON, Supt.

CHELSEA, May 1, 1871.

Mr. E. DUFFEE.

We are using your Purifying Trays, and find them to be the *best of any* that I have used, and will *purify more gas with less pressure* than any tray that I know. I can fully recommend them, after four years trial, to any Gas Superintendent with perfect safety, as the *cheapest and best Tray made.*

Yours truly, JOHN ANDREW, Sup't.

DORCHESTER, March 3, 1870.

Mr. E. DUFFEE.

Dear Sir: We have had your Gas Trays in constant use for almost one year and six months and find them superior to any others we have ever used, both in point of economy and efficiency. Truly yours, W. B. BROOKS,
Agent Dorchester Gas-Light Co.

JAMAICA PLAINS, MASS., June 21, 1871.

EDWARD DUFFEE, ESQ.

Dear Sir: The Trays ordered by this company three years ago, are getting somewhat worn. I wish to say here that I consider your Trays to be superior to any yet invented, therefore please make us another set at the price named, to be like the sample shown in every way, and oblige Yours truly
JAMES F. ROGERS,
Sup't Jamaica Plains Gas-Light Co.

BROOKLINE, June 11, 1871.

E. DUFFEE, ESQ.

Dear Sir: You will please make a set of Gas Trays for this company as soon as convenient, at price named. In regard to the merits of the Tray, after having them in constant use for over two years, I will say that I consider them *superior to any Tray* manufactured in this country. Respectfully yours,
H. A. ALLYN,
Sup't Brookline Gas-Light Co.

BANGOR, August 2, 1870.

EDWARD DUFFEE, ESQ.

Dear Sir: Yours of the 20th ult. is received. In regard to your Gas Trays, I take pleasure in saying that they have been in use over two years, and have given perfect satisfaction and they are in good order at the present time; should have no hesitation in recommending them, believing they are the most durable and easiest kept in order of any with which I am acquainted. Respectfully yours,
W. H. PERRY, Sup't.

OFFICE OF THE SPRINGFIELD GAS-LIGHT CO.
SPRINGFIELD, MASS., Oct. 10, 1871.

MR. WARD,
President Hartford Gas-Light Co.

Dear Sir: I have been using Gas Screens made by the American Gas Screen Company, for nearly a year, and find them superior in every way to the wooden Screens made and formerly used by the Springfield Gas-Light Co. I can purify more gas with the same quantity of lime, there being more surface to the Screens; and I consider them more durable, and recommend them to your consideration.

Yours with great respect,
GEORGE DWIGHT.

ROXBURY, June 14, 1872.

EDW. DUFFEE, ESQ.

Dear Sir: In answer to your inquiry regarding your Patent Gas Screens, I am happy to be able to say, that after nearly three years constant use we are perfectly satisfied with them being able to purify over fifty per cent. more gas with them, than with any other Screen we have used.

Yours respectfully,
THOMAS J. PISBOU.

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Yours truly,
P. E. DEMILL, Secretary.

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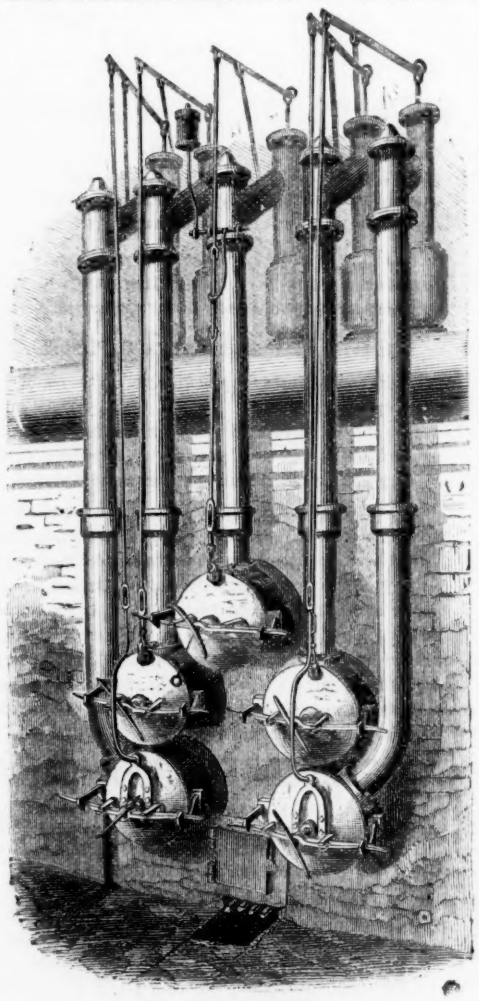

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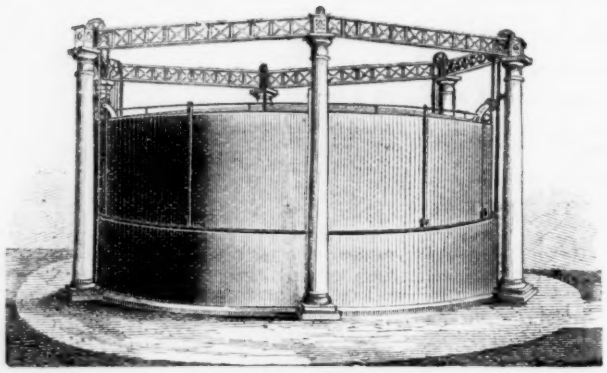

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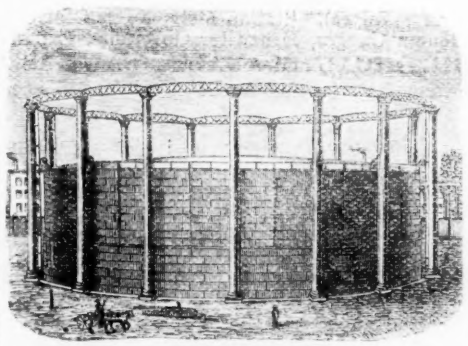

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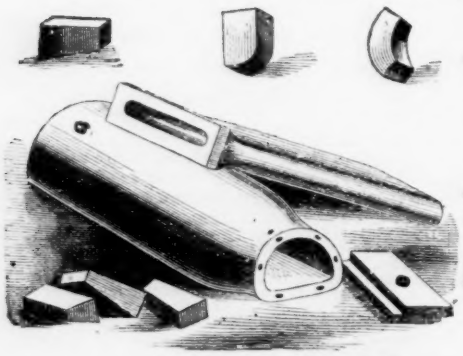


CLAY RETORTS FOR GAS WORKS AND SUGAR REFINERIES.

TILES AND BLOCKS OF ALL KINDS.

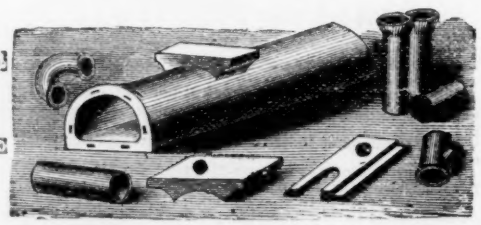
FIRE BRICK.

FIRE MORTAR, CLAY AND SAND.

ALL KINDS OF FIRE CLAY MATERIALS.

The Only XX Fire Brick.

☞ RETORTS OF THE VARIOUS SIZE KEPT ON HAND.



Vitrified Steam Pressed Drain and Sewer Pipe.

1849. HARRIS, GRIFFIN & CO., 1873.

12th and Brown Streets, Philadelphia, Penna.

and 49 DEY STREET, NEW YORK CITY.

Manufacturers of WET AND DRY GAS METERS, STATION METERS, SHOW AND TEST METERS, METER PROVERS, PRESSURE REGISTERS AND INDICATORS, BAR AND JET PHOTOMETERS, WET AND DRY CENTER VALVES, and all Apparatus pertaining to Gas Works in their line.

Patentee and Sole Manufacturer of the ORIGINAL and ONLY CORRECT GAS EXHAUST GOVERNOR.

We hereby caution all parties against making, vending, or using any GAS EXHAUST GOVERNOR that will be an encroachment of our patent.

The support and confidence of Gas Companies, so long enjoyed by us, encourage us to pursue the same undeviating course that has contributed to establish the character of our house, and with our extended experience and increased facilities, develop the latest improvement that Science can apply, in the construction of Gas Meters, etc., and thereby merit a continuance of the favors hitherto so liberally extended to us, always guaranteeing satisfaction.

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MANUFACTURER OF

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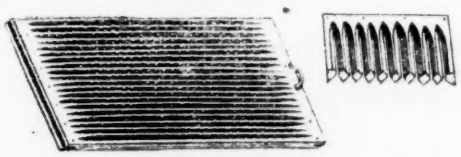

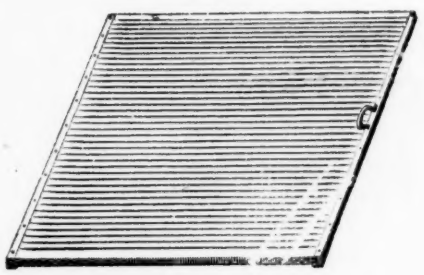

To Gas Companies.

The above Trays will last longer, and are cheaper than any Tray now used. They are now made without any outside strips, which gives more purifying surface, being perfectly smooth. The lime will not adhere to them as in other Trays. They are now used in over three hundred Gas Companies in he United States, and other places.

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151 and 153 Avenue C, New York.

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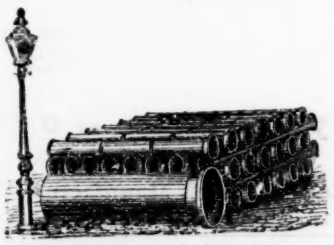
MANUFACTURERS OF

CAST IRON GAS & WATER PIPES, Matthews Patent Hydrants, Lamp Posts, Etc.



For the accommodation of parties who may want small lots Pipe for *immediate* delivery, we have established a yard in New York City.

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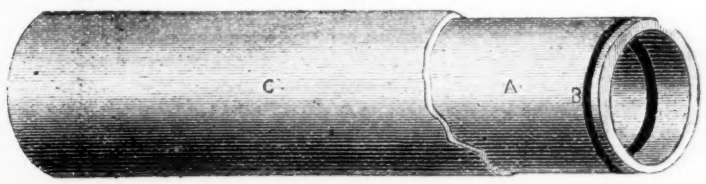
NORTHWESTERN
GAS AND WATER PIPE COMPANY.

WORKS, AT BAY CITY, MICHIGAN.

CHICAGO OFFICE, 646 WABASH AVENUE.

SECTION OF GAS PIPE.



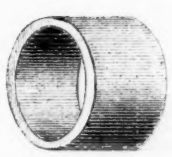


Fig. 2.

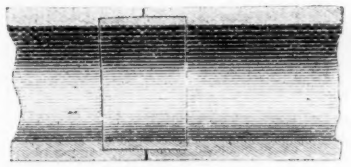


Fig. 3.

A—Cylinder of Wood. B—Band of Iron. C—Coating of Hydraulic or Asphaltum Cement.

Fig. 2.—Thimble for Connection. Fig. 3—Horizontal Section and Connection.

Above is a cut of the

"WYCKOFF PATENT IMPERISHABLE GAS PIPE,"

manufactured by the NORTHWESTERN GAS AND WATER PIPE COMPANY.

This Pipe is made of White Pine, one inch to sixteen inches bore, in sections eight feet long rounded in a lathe, coated inside and out with Asphaltum, connected with a tenon, or socket, and a thimble joint, perfectly air and water tight, being driven together with cement furnished by the Company. When laid its cost is about one half that of Iron Pipe, and is UNQUESTIONABLY the best Gas conducting Main in use.

☞ Send for Descriptive Pamphlet and Price List. 242-1y

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PLYMOUTH IRON WORKS,

CONSHOCKEN, PA.,

Manufacturers of

PIG IRON & CAST IRON GAS & WATER PIPES.

Also, Heavy and Light Castings of every description.
412 Walnut street, Philadelphia, Pa.

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FOR WATER AND GAS,

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OF EVERY DESCRIPTION,

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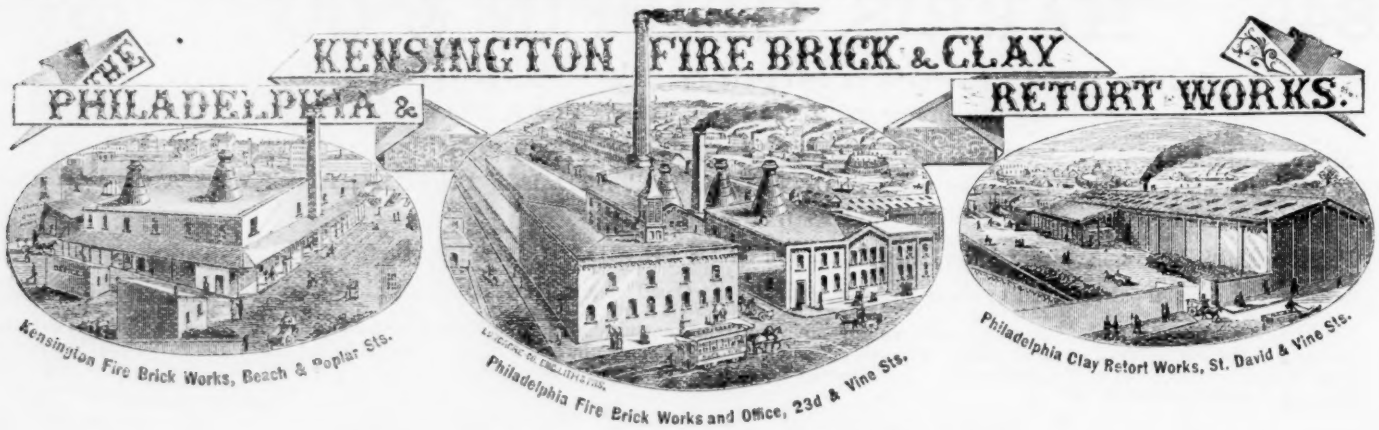
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KENSINGTON FIRE BRICK & CLAY
RETORT WORKS.
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(SUCCESSOR TO JOHN NEUKUMET),

Manufacturer of Fire Bricks, Tiles, Gas and Sugar House Retorts.

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FROM CLAY, SAME SPECIES, AND EQUAL TO

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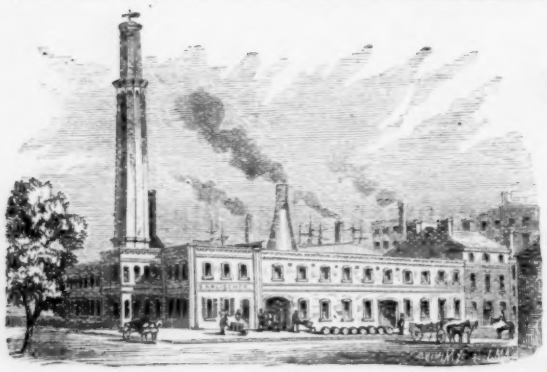

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FIRE BRICK AND CLAY

Retort Works.

☞ *Established in* 1845. ☜

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GAS RETORTS, TILES & FIRE BRICK
Of all shapes and sizes.

FIRE MORTAR, CLAY AND SAND.

Articles of every description made to order at the shortest notice.

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Manufactures of

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Of all shapes and sizes.

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The yield of this Asphalt is nearly double, and the Candle Power more than double the product of Gas Coals, and it is extensively used by great and small companies, chiefly as an enricher and stimulant, in the proportion of five per cent. Yield 15,000 to 16,000 feet per gross ton. Illuminating power 30 to 32 candles. One bushel of lime purifies 6000 feet. Coke very strong. It is incapable of spontaneous combustion or caking in the heap, and is used by simple addition to the charge.

We sell at figures which allow a much larger profit to the purchaser, with better light than any standard coal.

No gas material is at once so safe and so cheap. Our Asphalt is used in the manufacture of Varnish, Roofing, Ship Paint, Tiles, Pavements, Water Proof Paper, Cloth, and for all purposes where a coating is required that is unaffected by Water, Gasses, Alkalies, or Acids.

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CONSUMERS GAS METERS, WET AND DRY,

Station Meters, Center Seals, Governors, Pressure Registers,

AND ALL KINDS OF PRESSURE GAUGES.

Experimental Meters and Standard Test Gasholders,

☞ And all apparatus in use at the Gas Works ☜

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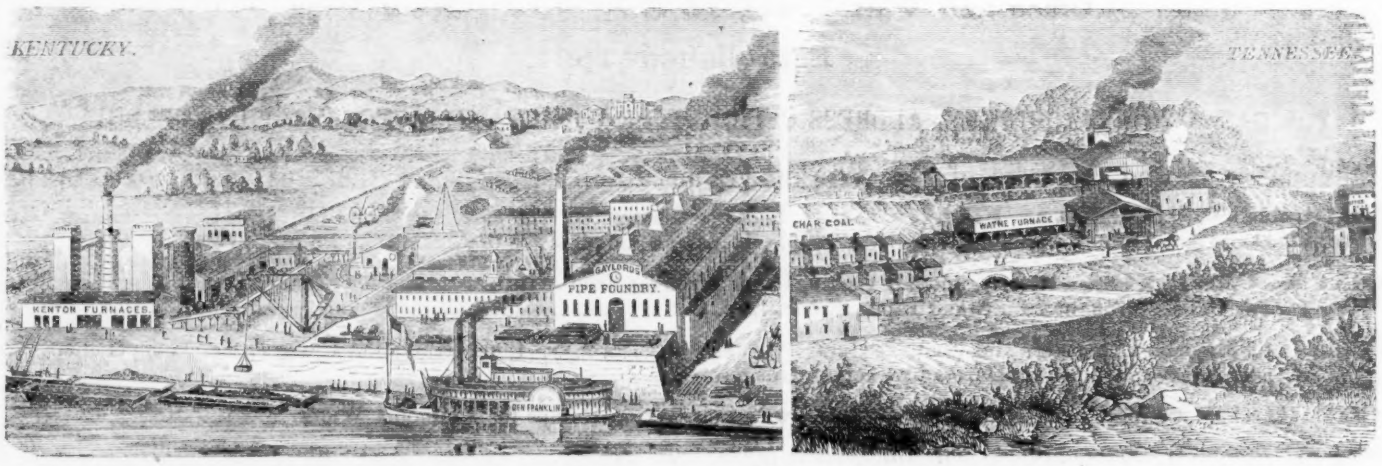


CAST IRON GAS AND WATER PIPE.

And all forms of Special Castings for Gas and Water Works.

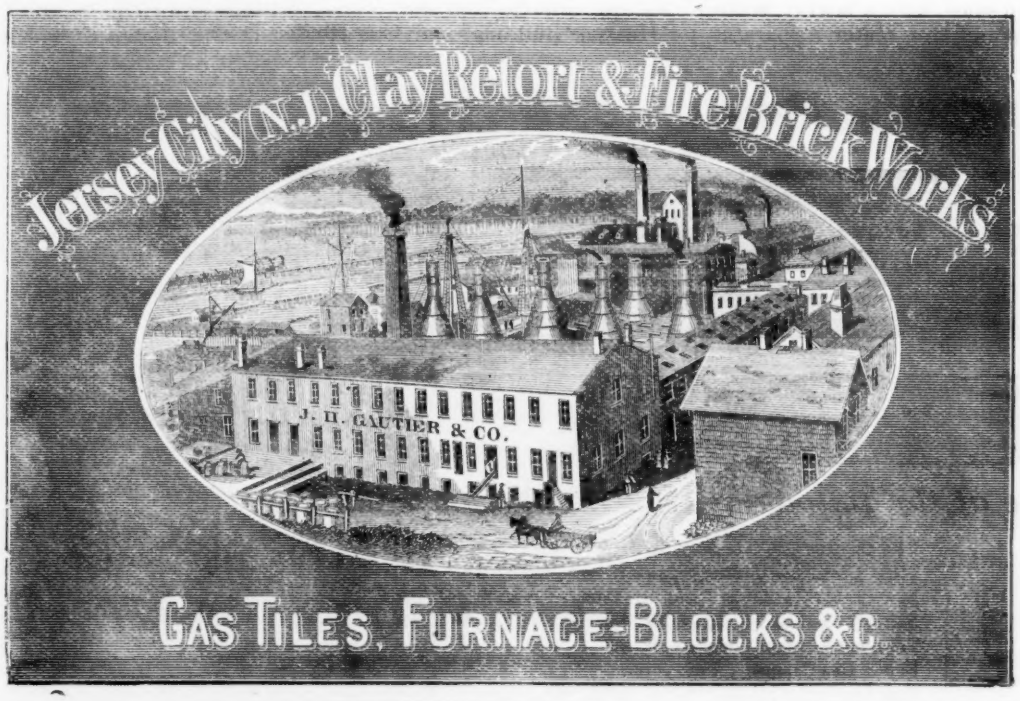
PIPE—2, 3, 4, 5, 6, 8, 10, 12, 14, 15, 16 to 60 inches 3 inches and above Cast in Dry Sand in 12 feet Lengths.

FLANGE, STEAM and HEATING PIPE.

Our KENTON FURNACE gives us a fine quality of Stone Coal Iron: this with our Tennessee Charcoal Iron, which we retain for our Foundry use, enables us, by controlling our Iron, to turn out Castings of a uniform and superior quality, and at a cost advantageous to our Customers.

Exclusive Manufacturers of the **ROBBINS JOINT** for Street Mains. The Superintendent of the Indianapolis Gas Company (and many others) say of this Joint: "Its superiority consists of facility in laying, economy in time and lead, and above all, its perfection as a joint.

Estimates given for Furnishing and Laying Street Mains with either common or Robbins Joint.



GEO. A. McILHENNY'S

PATENT

VACUUM PROCESS,

FOR RELIEVING GAS RETORTS FROM PRESSURE.

Patented in the United States and Great Britain, June 1867 first patent for this purpose in the United States (but not presented to the public until fully tested). Now in successful operation for six years, with most satisfactory results.

The many devices lately brought to the notice of the American public, to accomplish the same results are mostly old English contrivances tried and abandoned years ago, on account of the machinery, stuffing boxes, valves, levers, etc., necessary

But the extraordinary results obtained by the McIlhenny process, have induced some unprincipled persons to bring to the notice of the public, as *recent inventions of their own*, some of these old devices; their purpose seems to be simply to evade the patent.

This process is not only safe, simple and effective, but costs little to apply. The only machinery necessary is a one and a half inch stop cock, and a half inch stop cock to each bench No alteration in the old system is required. In fact, a Works operated with this process, can at any time be operated on the old pressure system, simply by closing the two stop cocks above mentioned. There is nothing to get out of order, nothing that requires special attention; no stuffing-boxes to pack and keep tight, no valves to keep clear of tar and pitch, no levers to lubricate, and no expense for a great amount of machinery.

The McIlhenny process challenges the world as regards yield and quality of gas.

For particulars apply to GEO. A. McILHENNY, Engineer of the Washington Gas-Light Co., Washington, D. C., or to WILLIAM YORKE, Engineer of the Portland Gas-Light Co., Portland, Me., who will take pleasure in corresponding with any one interested. 307-1y

GRAHAM'S

Patent Anti-Freezing LAMP POST.

THE BEST, CHEAPEST AND MOST DURABLE POST EVER OFFERED TO THE PUBLIC.

WOOSTER, OHIO
Jan. 24, 1871.

J. W. GRAHAM,

Dear Sir: Yours of the 14th inst at hand. In reply I would say that we have tested the six anti-freezing Lamp Posts purchased from you, and find them to be all as you represented. Whilst nearly a dozen of our sixty-five Posts were frozen down last month and first of this not one of yours was affected by the heavy frost. What can you sell them at?

Yours truly,
LUCAS FLATTERY
Sec'y Wooster Gas-Light Co.

Address the Patentee,

J. W. GRAHAM,
Chillicothe, Ohio.

250-9t

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Manufacturers and Builders of Gas Works, &c., of all Descriptions, of the Most Approved Plans.

WROUGHT IRON ROOF FRAMES.—For Slate, or Corrugated Iron Coverings, with Cast Iron Cornice Gutter. Iron Doors and Frames, Wrought Iron Pivot Blinds, Windows and all kinds of Castings and Smith Work for Buildings.

BENCH CASTINGS.—Retorts, and all Castings and Wrought Iron Work required for Setting them on the Latest Plan. Tar Gates, Wrought Iron Stand Pipes, Retort Lids, Cotter Bars, Coal and Coke Wagons, and Stokers' Tools.

EXHAUSTERS.—Exhausters and Compensators, By-Passes to pass from 4,000 to 150,000 Cubic feet of Gas per hour, with Engines, Governors, Pressure and Vacuum Guages.

SCRUBBERS.—Single or Multitubular Scrubbers, with Self-Acting Pumps for Ammonia Water.

WASHERS.—Cataract and Single and Multitubular Spray Washers

CONDENSERS.—Single and Multitubular Air and Water Condensers.

PURIFIERS.—For Purifying from 1,000 to 2,000,000 cubic feet capacity daily, with either wet or dry Lime, or Oxide of Iron, and with either Ash Rivetted or Wrought or Cast Iron Lime Sieves.

CARRIAGES.—Movable Lifting Carriages for Purifiers, arranged either for Floor or Overhead use.

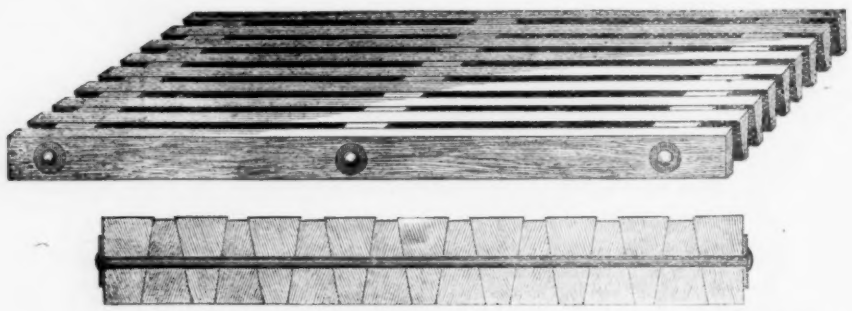
METERS.—Square and Round Meters of any capacity.

GAS HOLDERS.—Single Lift and Telescopic Gasholders, with Cast or Wrought Iron Suspension Frames.

GAS GOVERNORS.—Station Governors, with Regulating and Indicating Columns for Inlet and Outlet Pipes, also Dry Governors with Flexible Diaphragms for Underground Pipes.

STOP VALVES.—Double Faced Stop Valves for Gas or Water, from three inches to forty-eight inches diameter. These Valves are proved on both sides, with a heavy Water Pressure, Flange and Bell Pipes, Fittings and Drips of all descriptions. Steam Boilers and Hot Water Apparatus for Heating Building, and Gas Holder Tanks. Lamp Posts and Lanterns.

P. Munzinger's Patent Ash Lime Trays.



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Lowell Gas-Light Company, Mass.
Lynn Gas-Light Company, Mass.
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Jersey City Gas Company, N. J.
St. Paul Gas-Light Company, Minn.
Cumberland Gas-Light Company, Md.
Hartford City Gas-Light Company, Conn.
Richmond Gas Company, Va.
McKeesport Gas Company, Pa.
Middletown Gas Company, Pa.
East Newark Gas-Light Company, N. J.
Binghampton Gas Company, N. J.
Zanesville Gas Company, Ohio.

New Orleans Gas Company, La.
Salem Gas-Light Company, Mass.
New Britain Gas-Light Company, Conn.
Rahway Gas-Light Company, N. J.
Trenton Gas-Light Company, N. J.
Elmira Gas Company, New York.
Erie Gas Company, Pa.
Columbus Gas-Light Company, Ohio,
Westchester Gas-Light Company, N. Y.
Santa Cruz Gas Company, Cal.
Lawrence Gas-Light Company, Kansas.
Salem Gas Company, N. J.
Indiana Gas-Light Company, Pa.
Peoria Gas Company, Ill.
Montclair Gas Company, N. J.
Williamsport Gas Company, Pa.
Wooster Gas-Light Company, Ohio.

Augusta Gas-Light Company, Ga.
Huntsville Gas Company, Ga.
Chattanooga Gas Company Tenn.
Murfreesboro Gas Company, Tenn.
Hagerstown Gas-Light Company, Md.
Hanover Gas Company, Pa.
Easton Gas Company, Pa.
Uniontown Gas-Light Company, Pa.
Coatesville Gas-Light Company, Pa.
Houston, Gas Company, Texas.
Wilkesbarre Gas Company, La.
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Newark Gas Company, Ohio.
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And numerous other Companies.